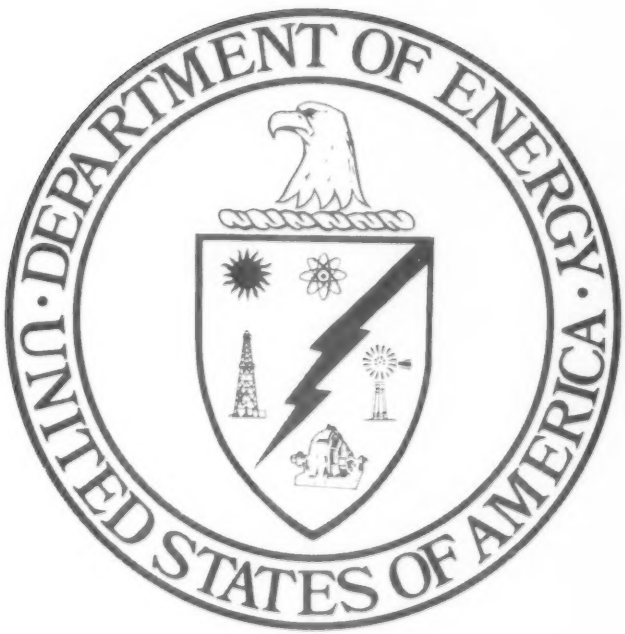
VOL. 3 NO. 19
October 15, 1978

Energy Research Abstracts

ABSTRACTS 44021-46147



Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

REPORT COLLECTIONS IN THE UNITED STATES

The libraries listed below purchase and maintain microfiche collections of DOE and foreign reports that are abstracted in *ERA*. Most of these libraries have microfiche reader-printers or other photocopy facilities with which to reproduce enlarged copies from microfiche. Charges for reproduction services vary.

ALABAMA
Auburn, Auburn University
Tuskegee Institute, Tuskegee Institute

ARIZONA
Tucson, University of Arizona

CALIFORNIA
Davis, University of California
Los Angeles, University of California
Santa Barbara, University of California

COLORADO
Boulder, University of Colorado

DISTRICT OF COLUMBIA
Washington, Library of Congress

FLORIDA
Gainesville, University of Florida

GEORGIA
Atlanta, Georgia Institute of Technology

HAWAII
Honolulu, University of Hawaii

IDAHO
Pocatello, Idaho State University

ILLINOIS
Urbana, University of Illinois

INDIANA
Lafayette, Purdue University

IOWA
Ames, Iowa State University

KANSAS
Manhattan, Kansas State University

KENTUCKY
Lexington, University of Kentucky

MARYLAND
Baltimore, Johns Hopkins University
College Park, University of Maryland

MASSACHUSETTS
Cambridge, Massachusetts Institute of Technology
Worcester, Worcester Polytechnic Institute

MICHIGAN
Ann Arbor, University of Michigan

MISSISSIPPI
State College, Mississippi State University

MISSOURI
Columbia, University of Missouri
Kansas City, Linda Hall Library

NEW JERSEY
Princeton, Princeton University

NEW MEXICO
Albuquerque, University of New Mexico

NEW YORK
Albany, New York State Library
Albany, State University at Albany
Ithaca, Cornell University
New York, Columbia University
Rochester, University of Rochester
Syracuse, Syracuse University

NORTH CAROLINA
Raleigh, North Carolina State University

OHIO
Cincinnati, University of Cincinnati
Cleveland, Cleveland Public Library
Toledo, University of Toledo

OKLAHOMA
Norman, University of Oklahoma

PENNSYLVANIA
Pittsburgh, Carnegie Library
University Park, Pennsylvania State University

PUERTO RICO
San Juan, University of Puerto Rico

SOUTH CAROLINA
Columbia, University of South Carolina

TEXAS
Austin, University of Texas
College Station, Texas A & M University
Houston, Rice University

UTAH
Salt Lake City, University of Utah

VIRGINIA
Charlottesville, University of Virginia

WASHINGTON
Pullman, Washington State University
Seattle, University of Washington

WEST VIRGINIA
Morgantown, West Virginia University

WISCONSIN
Madison, University of Wisconsin

DOE reports so indicated in *Energy Research Abstracts* are offered for sale by National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161.

CORRECTIONS

ERA Vol. 3, No. 2, Abst. 5660, line 1 should read: (ORO-3405-31) Investigation of universal plasma instabilities.

ERA Vol. 3, No. 3, Abst. 6672, line 1 should read: (TID-27796) LOFT integral test system final safety

ERA Vol. 3, No. 3, Abst. 6678, lines 3 and 4 should read: Resnik, W.M. II; Bosler, G.E. (Los Alamos Scientific Lab., N. Mex. (USA)). Sep 1977. Contract W-7405-ENG-36.

ERA Vol. 3, No. 3, Abst. 6806, line 1 should read: (TID-27797) LOFT integral test system final safety

ERA Vol. 3, No. 3, Abst. 7773, line 1 should read: (SAND-77-1550C) Neutron production from advanced

ERA Vol. 3, No. 4, Abst. 8525, line 1 should read: (TID-27794) LOFT integral test system final safety

ERA Vol. 3, No. 4, Abst. 8551, line 1 should read: (ANL-K-77-3723-1(Vol.2)) Design and cost study of a nickel–iron

ERA Vol. 3, No. 4, Abst. 8580, line 3 should read: (1977). 108p. (NP-22657).

ERA Vol. 3, No. 5, Abst. 9663, line 1 should read: (TID-27789) Annual review of selected mining research

ERA Vol. 3, No. 5, Abst. 10601, line 1 should read: (NP-22673) Selected research projects leading to the

ERA Vol. 3, No. 7, Abst. 13627, line 1 should read: (FE-1521-29) Design report. Volume 10. Mechanical

ERA Vol. 3, No. 7, Abst. 15607, line 1 should read: (LA-UR-77-1997) Nonlinear hydrodynamic forces on

ERA Vol. 3, No. 7, Abst. 16255, line 1 should read: (GA-A-14648) Parallel connecting poloidal coil system

ERA Vol. 3, No. 8, Abst. 16955, line 1 should read: (SAND-77-1270(Pt.2)) Seabed Disposal Program. Annual

ERA Vol. 3, No. 8, Abst. 19335, line 1 should read: (ORO-1797-77) Research in nuclear chemistry. Progress

ERA Vol. 3, No. 9, Abst. 21201, line 1 should read: (GJT-12S) Summary of the Phase II, Title I, engineering

ERA Vol. 3, No. 9, Abst. 22113, line 1 should read: (LA-tr-77-90) Systems of RF field stabilization and co-

ERA Vol. 3, No. 9, Abst. 22215, line 1 should read: (TID-27790) Suspended particulates and natural radionu-

ERA Vol. 3, No. 10, Abst. 23417, line 1 should read: (TID-27782) Institutional applications of solar total

ERA Vol. 3, No. 10, Abst. 24049, line 1 should read: (LTR-112-118) LOFT LOCE transient thermal analy-

ERA Vol. 3, No. 10, Abst. 24245, line 1 should read: (TID-27777) Proposed synthetic fuels commercial dem-

ERA Vol. 3, No. 10, Abst. 26059, line 1 should read: (ANL-K-77-3805-1) Analysis of design changes necessary to

ERA Vol. 3, No. 10, Abst. 29548, delete line 4 which reads: NTIS PC A03/MF A01

Volume 3, Number 19, October 15, 1978

ENERGY RESEARCH ABSTRACTS

Published by the **Technical Information Center, Oak Ridge, Tennessee**
United States Department of Energy

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors.

Subject matter includes the entirety of DOE's research, development, demonstration and technological programs resulting from its broad charter for energy systems, conservation, safety, environmental protection, physical research and biology and medicine. *ERA* also covers other U. S. Government sponsored energy information and the international literature on reactor technology, waste processing and storage, and fusion technology. In addition, nonnuclear information obtained from foreign governments under agreements for cooperation is covered.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Federal, state, and municipal agencies concerned with energy development, conservation and usage may obtain *ERA* free of charge. Inquiries should be directed to the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues including a semiannual index and an annual index is $184.00 for domestic subscribers and $230.00 for foreign subscribers. The semiannual and annual index will also be available separately to subscribers. The cost for the semiannual index is $18.00 (domestic) or $22.50 (foreign); the annual index is $33.00 (domestic) or $41.25 (foreign). A single issue costs $5.55 (domestic) or $6.95 (foreign).

INDEXES TO ERA

Comprehensive indexes appear in each issue and are cumulated at the end of each volume. The report number indexes will be cumulated on both a volume and multivolume basis.

All documents abstracted are indexed by subjects and personal authors. Report literature is indexed also by corporate author and report number. DOE reports are indexed by contract number. Each of these indexes is preceded by an introduction explaining in detail the organization of the index and the principles by which it is compiled. The reader is referred to these explanations for information not found in the brief summaries below.

Corporates

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

262 (EPRI-NP–404) Radioactivity in mixed oxide fabrication using LWR recycle plutonium. Final report. Uotinen, V.O.; Harrison, J.L.; Caldwell, C.S.; Kerr, J.M.; Woods, C.R. **(Babcock and Wilcox Co., Lynchburg, Va. (USA)).** Apr 1977. 220p. Dep. NTIS, PC A10/MF A01.

is indexed as:

Babcock and Wilcox Co., Lynchburg, Va. (USA).
Radioactivity in mixed oxide fabrication using LWR recycle plutonium. Final report, 3:262 (EPRI-NP–404)

Babcock and Wilcox Co., Lynchburg, Va. (USA). Nuclear Power Generation Div.
Methods of compliance with fracture toughness and operational requirements of 10 CFR 50, appendix G, 3:639 (BAW–10046A(Rev.1))

Personal Authors

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Abe, K., *See* Miettinen, H.E., 3:1645
See O'Fallon, J.R., 3:1642

Abey, A., *See* Schatz, J., 3:1561

Abey, A.E., Apparatus for deformation tests at intermediate strain rates—10^{-2} to 10^{-2} s^{-1}—and at high pressure, 3:1118 (UCRL–79012)

Abou-Sayed, A.S., *See* Jones, A.H., 3:202

Subjects

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

Examples:

ELECTRIC POWER/RESEARCH PROGRAMS
Key to utility R and D facts (EPRI R and D information system, Palo Alto), 3:1026

ELECTRIC UTILITIES
See PUBLIC UTILITIES

ELECTRICAL EQUIPMENT
See also CAPACITORS
LIGHTNING ARRESTERS
RELAYS
RESISTORS
TRANSFORMERS
Interactive program for checking coordination of protective devices (To aid MESA inspectors), 3:109

Contract Numbers

DOE technical report literature is also indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

E(11-1)-3162	3:457	COO-3162-32
E(49-26)-1016	3:487	CONF-760492-
E(49-26)-1027	3:461	ERDA/USN/1027-76/1(Vol.5)
EF-77-C-01-2566	3:28	FE-2566-05
EF-77-S-02-4227	3:55	COO-4227-1

Report Numbers

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. While not reports, patents and conference papers are indexed here as a matter of convenience.

FEA/D-		
77/207	3:1023	GPO
FEA/G-		
77/306	3:1015	Federal Energy Administration, Washington, DC
FHWA/HP/HS-		
75/03	3:1078	*See* PB-267552
GEAP-		
10207-39	3:843	Dep. NTIS, PC A03/MF A01

AVAILABILITY OF PUBLICATIONS ABSTRACTED

Public availability of all DOE reports is indicated in the report number indexes. The availability of other reports, when known, is also indicated. The availability of some unnumbered reports is given in the abstract.

Information on the availability of the published literature and unpublished conference papers abstracted in *ERA* can be obtained from the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

CONTENTS

Category	Page
COAL AND COAL PRODUCTS	4363
PROCESSING	4363
CARBONIZATION	4363
DESULFURIZATION AND PURIFICATION	4363
HYDROGENATION	4364
GASIFICATION	4364
LIQUEFACTION	4367
PYROLYSIS AND CRACKING	4369
SOLVENT EXTRACTION	4369
BY-PRODUCTS	4369
PROPERTIES	4369
WASTE MANAGEMENT	4370
ENVIRONMENTAL ASPECTS	4370
RESERVES AND EXPLORATION	4371
MINING	4371
TRANSPORT AND HANDLING	4373
COMBUSTION	4374
MARKETING AND ECONOMICS	4375
HEALTH AND SAFETY	4375
REGULATIONS	4375
PETROLEUM	4376
GEOLOGY AND EXPLORATION	4376
DRILLING AND PRODUCTION	4376
PROCESSING	4377
PRODUCTS AND BY-PRODUCTS	4378
MARKETING AND ECONOMICS	4379
ENVIRONMENTAL ASPECTS	4379
POLICY, LEGISLATION, AND REGULATION	4380
TRANSPORT, PIPELINES, AND HANDLING	4380
PROPERTIES	4381
NATURAL GAS	4381
GEOLOGY AND EXPLORATION	4381
DRILLING, PRODUCTION, AND PROCESSING	4381
HEALTH AND SAFETY	4381
ENVIRONMENTAL EFFECTS	4381
ARTIFICIAL STIMULATION, PLOWSHARE, ETC.	4381
POLICY, LEGISLATION, AND REGULATION	4382
PROPERTIES	4382
OIL SHALES AND TAR SANDS	4382
SITE GEOLOGY AND HYDROLOGY	4382
SITE GEOLOGY	4382
DRILLING, FRACTURING, AND MINING	4382
OIL PRODUCTION, RECOVERY, AND REFINING	4382
IN SITU METHODS, TRUE AND MODIFIED	4382
SURFACE METHODS	4383
REFINING	4383
PROPERTIES AND COMPOSITION	4383
ENVIROMENTAL ASPECTS	4383
NUCLEAR FUELS	4384
RESERVES	4384
EXPLORATION	4384
MINING	4386
FEED PROCESSING	4387
ENRICHMENT	4387
GASEOUS DIFFUSION	4387
LASER EXCITATION	4387
FUELS PRODUCTION AND PROPERTIES	4387
SPENT FUELS REPROCESSING	4387
TRANSPORT AND STORAGE	4388
MARKETING AND ECONOMICS	4388
WASTE MANAGEMENT	4389
WASTE PROCESSING	4389
WASTE DISPOSAL AND STORAGE	4390
ENVIRONMENTAL ASPECTS	4391
HEALTH AND SAFETY	4392
REGULATIONS	4392
ACCOUNTABILITY AND SAFEGUARDS	4392
FUSION FUELS	4393
PROCESSING	4393
FABRICATION AND TESTING	4393
WASTE MANAGEMENT	4394
ISOTOPE AND RADIATION SOURCE TECHNOLOGY	4394
PHYSICAL ISOTOPE SEPARATION	4394
HEAVY WATER PRODUCTION	4394
RADIATION SOURCES	4394
DESIGN AND FABRICATION	4394
ISOTOPIC POWER SUPPLIES	4394
HYDROGEN	4394
PRODUCTION	4394
ELECTROLYSIS	4395
THERMOCHEMICAL PROCESSES	4395
STORAGE	4395
INDUSTRIAL AND COMMERCIAL USE	4395
OTHER SYNTHETIC AND NATURAL FUELS	4395
HYDROCARBON FUELS	4395
PREPARATION	4395
CHEMICAL SYNTHESIS	4395
PREPARATION FROM WASTES OR BIOMASS	4396
PREPARATION	4396
SOLID WASTE FUELS	4396
SOLAR ENERGY	4397
RESOURCES AND AVAILABILITY	4397
ECONOMICS	4397
ENVIRONMENTAL, LEGAL, AND INSTITUTIONAL ASPECTS	4398
SOLAR ENERGY CONVERSION	4398
PHOTOVOLTAIC CONVERSION	4398
BIOMASS PRODUCTION AND CONVERSION	4401
PHOTOCHEMICAL AND THERMOCHEMICAL CONVERSION	4401
PHOTOVOLTAIC POWER PLANTS	4402
SOLAR THERMAL POWER PLANTS	4402
CENTRAL RECEIVER	4402
TOTAL ENERGY AND HYBRID SYSTEMS	4402
OCEAN THERMAL GRADIENT POWER PLANTS	4402
SOLAR RADIATION UTILIZATION	4402
SPACE HEATING AND COOLING	4403
AGRICULTURAL AND INDUSTRIAL PROCESS HEAT	4406
WATER HEATING	4407
OTHER	4407
SOLAR COLLECTORS AND CONCENTRATORS	4408
HEAT STORAGE	4415
GEOTHERMAL ENERGY	4416
RESOURCE STATUS AND ASSESSMENT	4416
USA	4416
NON-USA	4416
GEOLOGY, HYDROLOGY, AND GEOTHERMAL SYSTEMS	4416
NON-USA	4416
GEOTHERMAL EXPLORATION AND EXPLORATION TECHNOLOGY	4417
GEOPHYSICAL TECHNIQUES AND SURVEYS	4417
GEOCHEMICAL TECHNIQUES AND SURVEYS	4418

Category	Page
EXPLORATORY DRILLING AND WELL LOGGING	4419
ECONOMIC AND FINANCIAL ASPECTS	4419
ENVIRONMENTAL ASPECTS AND WASTE DISPOSAL	4419
GEOTHERMAL POWER PLANTS	4419
DESIGN AND OPERATION	4419
GEOTHERMAL ENGINEERING	4419
DRILLING TECHNOLOGY AND WELL HARDWARE	4419
CORROSION, SCALING, AND MATERIALS DEVELOPMENT	4419
SAFETY AND CONTROL	4419
RESERVOIR STIMULATION AND EXTRACTION TECHNOLOGY	4420
DIRECT ENERGY UTILIZATION	4420
GEOTHERMAL DATA AND THEORY	4420
ROCK-WATER-GAS INTERACTIONS	4420
WIND ENERGY	4420
WIND ENERGY ENGINEERING	4420
APPLICATIONS	4420
TURBINE DESIGN AND OPERATION	4420
SITE CHARACTERISTICS	4420
ELECTRIC POWER ENGINEERING	4421
POWER PLANTS AND POWER GENERATION	4421
COOLING AND HEAT TRANSFER EQUIPMENT AND SYSTEMS	4421
POWER CYCLES	4422
COMPONENTS	4422
WASTE HEAT UTILIZATION	4422
ECONOMICS	4422
OFF-PEAK ENERGY STORAGE	4423
FUELS	4423
ENVIRONMENTAL ASPECTS	4423
NOXIOUS GAS AND PARTICULATE ABATEMENT AND CONTROL	4423
POWER TRANSMISSION AND DISTRIBUTION	4423
AC SYSTEMS, EHV AND UHV	4423
SUPERCONDUCTING AND CRYOGENIC SYSTEMS	4423
NUCLEAR POWER PLANTS	4423
POWER REACTORS, NON-BREEDING, LIGHT-WATER MODERATED, BOILING WATER COOLED	4425
POWER REACTORS, NON-BREEDING, LIGHT-WATER MODERATED, NON-BOILING WATER COOLED	4426
POWER REACTORS, NON-BREEDING, GRAPHITE MODERATED	4427
POWER REACTORS, NON-BREEDING, OTHERWISE MODERATED OR UNMODERATED	4427
POWER REACTORS, BREEDING	4430
REGULATION AND LICENSING	4432
REACTOR DOCKETS	4433
ECONOMICS	4433
CONSTRUCTION AND OPERATION	4434
FUEL CYCLE	4334
PROCESS HEAT REACTORS	4434
NUCLEAR REACTOR TECHNOLOGY	4434
THEORY AND CALCULATION	4434
COMPONENTS AND ACCESSORIES	4436
FUEL ELEMENTS	4438
CONTROL SYSTEMS	4439
ENVIRONMENTAL ASPECTS	4439
RADIOACTIVE EFFLUENTS	4439
CHEMICAL AND THERMAL EFFLUENTS	4439
RESEARCH, TEST, AND EXPERIMENTAL REACTORS	4439
PLUTONIUM AND ISOTOPE PRODUCTION REACTORS	4441
PROPULSION REACTORS	4441
REACTOR SAFETY	4441
ENERGY STORAGE	4445
MAGNETIC	4445
COMPRESSED GAS	4446
PUMPED HYDRO	4446
FLYWHEELS	4446
THERMAL	4446
CHEMICAL	4447
BATTERIES	4447
DESIGN AND DEVELOPMENT	4447
MATERIALS, COMPONENTS, AND AUXILIARIES	4447
ENERGY MANAGEMENT AND POLICY	4447
ENERGY ANALYSIS AND MODELING	4447
ECONOMICS AND SOCIOLOGY	4448
ENVIRONMENT, HEALTH, AND SAFETY	4448
ENERGY RESOURCES	4448
RESEARCH AND DEVELOPMENT	4449
NUCLEAR ENERGY	4449
WASTE HEAT UTILIZATION	4449
CONSERVATION	4449
SUPPLY, DEMAND, AND FORECASTING	4449
POLICY, LEGISLATION, AND REGULATION	4450
FOSSIL FUELS	4451
COAL	4451
PETROLEUM	4451
NATURAL GAS	4451
HYDROGEN AND SYNTHETIC FUELS	4451
ELECTRIC POWER	4451
ELECTRIC POWER GENERATION	4452
CONSUMPTION AND UTILIZATION	4452
UNCONVENTIONAL SOURCES AND POWER GENERATION	4452
SOLAR	4452
ENERGY CONVERSION	4452
MHD GENERATORS	4452
DESIGN AND DEVELOPMENT	4452
MATERIALS, COMPONENTS, AND AUXILIARIES	4453
DUCT ENGINEERING AND FLUID DYNAMICS	4453
THERMOELECTRIC GENERATORS	4453
DESIGN AND DEVELOPMENT	4453
THERMIONIC CONVERTERS	4453
PERFORMANCE AND TESTING	4453
FUEL CELLS	4453
DESIGN AND DEVELOPMENT	4453
PERFORMANCE AND TESTING	4454
MATERIALS, COMPONENTS, AND AUXILIARIES	4454
ELECTROMECHANICAL CONVERTERS	4454
ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION	4454
BUILDINGS	4454
RESIDENTIAL BUILDINGS	4456
OFFICE BUILDINGS	4457
SCHOOL, MUNICIPAL AND OTHER PUBLIC BUILDINGS	4457
COMMERCIAL AND INDUSTRIAL BUILDINGS	4457
TRANSPORTATION	4457
AIR AND AEROSPACE	4457
LAND AND ROADWAY	4457
SEA AND WATER	4457
INDUSTRY AND AGRICULTURE	4458
MATERIALS	4458
EQUIPMENT AND PROCESSES	4458
WASTE HEAT RECOVERY AND UTILIZATION	4458
INDUSTRIAL WASTE MANAGEMENT	4458
MUNICIPALITIES AND COMMUNITY SYSTEMS	4459
CONSERVATION SERVICES	4459
PUBLIC SERVICES	4459

Category	Page
PUBLIC UTILITIES	4459
MUNICIPAL WASTE MANAGEMENT	4459
ADVANCED AUTOMOTIVE PROPULSION SYSTEMS	4459
SPARK-IGNITION	4459
ROTARY	4459
ELECTRIC-POWERED SYSTEMS	4459
HYBRID SYSTEMS	4459
FLYWHEEL PROPULSION	4460
VEHICLE DESIGN FACTORS	4460
ENGINE-TRANSMISSION MATCHING	4460
ENGINE SYSTEM	4460
EMISSION CONTROL	4460
NITROGEN OXIDES	4460
CARBON MONOXIDE	4461
HYDROCARBONS	4462
MATERIALS	4462
METALS AND ALLOYS	4463
PREPARATION AND FABRICATION	4463
STRUCTURE AND PHASE STUDIES	4463
MECHANICAL PROPERTIES	4464
PHYSICAL PROPERTIES	4465
CORROSION AND EROSION	4468
RADIATION EFFECTS	4468
CERAMICS, CERMETS, AND REFRACTORIES	4469
PREPARATION AND FABRICATION	4469
STRUCTURE AND PHASE STUDIES	4469
MECHANICAL PROPERTIES	4469
PHYSICAL PROPERTIES	4469
RADIATION EFFECTS	4470
POLYMERS AND PLASTICS	4470
STRUCTURE AND PHASE STUDIES	4470
MECHANICAL PROPERTIES	4470
PHYSICAL PROPERTIES	4470
OTHER MATERIALS	4470
PREPARATION AND MANUFACTURE	4470
STRUCTURE AND PHASE STUDIES	4470
PROPERTIES	4471
CORROSION, EROSION, AND DEGRADATION	4472
RADIATION EFFECTS	4472
CHEMISTRY	4473
ANALYTICAL AND SEPARATIONS CHEMISTRY	4473
ACTIVATION AND NUCLEAR REACTION PROCEDURES	4473
CHEMICAL PROCEDURES	4473
RADIOMETRIC AND RADIOCHEMICAL PROCEDURES	4474
SPECTRAL PROCEDURES	4474
SEPARATION PROCEDURES	4474
INORGANIC AND PHYSICAL CHEMISTRY	4474
CHEMICAL AND PHYSICOCHEMICAL PROPERTIES	4474
ISOTOPE EXCHANGE AND ISOTOPE SEPARATION	4475
CHEMICAL AND PHYSICOCHEMICAL PROPERTIES	4475
ELECTROCHEMISTRY	4475
PHOTOCHEMISTRY	4475
RADIATION CHEMISTRY	4475
RADIOCHEMISTRY AND NUCLEAR CHEMISTRY	4475
PROPERTIES OF RADIOACTIVE MATERIALS	4475
COMBUSTION CHEMISTRY	4476
ENGINEERING	4476
GENERAL ENGINEERING	4476
FACILITIES AND EQUIPMENT	4476
CRYOGENIC AND SUPERCONDUCTING EQUIPMENT AND DEVICES	4476
PROTECTIVE STRUCTURES AND EQUIPMENT	4477
HANDLING EQUIPMENT AND PROCEDURES	4478
SHIPPING CONTAINERS	4478
TRANSPORT AND STORAGE FACILITIES	4478
MINING AND DRILLING EQUIPMENT AND FACILITIES	4479
LASERS	4479
HEAT TRANSFER AND FLUID FLOW	4484
MATERIALS TESTING	4484
VACUUM ENGINEERING	4484
ELECTRONIC CIRCUITS AND DEVICES	4484
COMBUSTION SYSTEMS	4485
UNDERGROUND ENGINEERING	4485
MARINE ENGINEERING	4485
POLLUTION CONTROL EQUIPMENT	4485
POWER CYCLES	4486
BRAYTON	4486
STIRLING	4486
OTHER	4486
PARTICLE ACCELERATORS	4486
DESIGN, DEVELOPMENT, AND OPERATION	4486
BEAM DYNAMICS, FIELD CALCULATIONS, AND ION OPTICS	4486
AUXILIARIES AND COMPONENTS	4486
ION SOURCES	4487
STORAGE RINGS	4487
INSTRUMENTATION	4487
RADIATION INSTRUMENTATION	4487
GENERAL DETECTORS AND MONITORS	4487
RADIATION DOSEMETERS	4488
NUCLEAR SPECTROSCOPIC INSTRUMENTATION	4488
RADIOMETRIC INSTRUMENTS	4488
RADIATION EFFECTS ON INSTRUMENT COMPONENTS, INSTRUMENTS, OR ELECTRONIC SYSTEMS	4488
MISCELLANEOUS INSTRUMENTS	4488
WELL LOGGING INSTRUMENTATION	4489
EXPLOSIONS AND EXPLOSIVES	4490
CHEMICAL	4490
NUCLEAR	4490
CIVIL USES	4490
WEAPONRY	4490
EXPLOSION DETECTION	4490
ENVIRONMENTAL SCIENCES; ATMOSPHERIC	4490
BASIC STUDIES	4491
CHEMICALS MONITORING AND TRANSPORT	4491
RADIOACTIVE MATERIALS MONITORING AND TRANSPORT	4493
SITE RESOURCE AND USE STUDIES	4494
REGULATIONS	4494
ENVIRONMENTAL SCIENCES, TERRESTRIAL	4494
CHEMICALS MONITORING AND TRANSPORT	4494
RADIOACTIVE MATERIALS MONITORING AND TRANSPORT	4495
SOIL	4495
TERRESTRIAL ECOSYSTEMS AND FOOD CHAINS	4495
SITE RESOURCE AND USE STUDIES	4495
REGULATIONS	4495
ENVIRONMENTAL SCIENCES, AQUATIC	4495
BASIC STUDIES	4495
CHEMICALS MONITORING AND TRANSPORT	4495
RADIOACTIVE MATERIALS MONITORING AND TRANSPORT	4499
WATER	4499
AQUATIC ECOSYSTEMS AND FOOD CHAINS	4499
THERMAL EFFLUENTS MONITORING AND TRANSPORT	4500
SITE RESOURCE AND USE STUDIES	4500
REGULATIONS	4500

Category	Page
ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES	4500
SOCIAL AND ECONOMIC STUDIES	4500
ASSESSMENT OF ENERGY TECHNOLOGIES	4500
ENVIRONMENTAL IMPACT STATEMENTS	4500
BIOMEDICAL SCIENCES, BASIC STUDIES	4500
BEHAVIORAL BIOLOGY	4500
BIOCHEMISTRY	4501
TRACER TECHNIQUES	4501
CYTOLOGY	4501
TRACER TECHNIQUES	4501
GENETICS	4501
METABOLISM	4502
MEDICINE	4502
TRACER TECHNIQUES	4503
MICROBIOLOGY	4504
PATHOLOGY	4504
PHYSIOLOGICAL SYSTEMS	4504
PUBLIC HEALTH	4504
AGRICULTURE AND FOOD TECHNOLOGY	4504
BIOMEDICAL SCIENCES, APPLIED STUDIES	4504
EXTERNAL SOURCE	4504
RADIATION EFFECTS ON ANIMALS	4504
MAN	4504
VERTEBRATES	4505
RADIONUCLIDE EFFECTS - INTERNAL SOURCE	4505
MAN	4505
ANIMALS	4505
NUCLIDE KINETICS AND TOXICOLOGY	4505
MAN	4505
ANIMALS	4505
THERMAL EFFECTS	4505
CELLS	4506
CHEMICALS METABOLISM AND TOXICITY	4506
MICROORGANISMS	4506
PLANTS	4506
INVERTEBRATES	4506
VERTEBRATES	4507
MAN	4508
OTHER ENVIRONMENTAL POLLUTANT EFFECTS	4508
HEALTH AND SAFETY	4508
GEOSCIENCES	4508
GEOLOGY AND HYDROLOGY	4508
GEOPHYSICS	4508
SEISMOLOGY AND TECTONICS	4508
GEOPHYSICAL SURVEY METHODS	4509
MINERALOGY, PETROLOGY, AND ROCK MECHANICS	4509
GEOCHEMISTRY	4509
OCEANOGRAPHY	4509
PHYSICS RESEARCH	4510
ASTROPHYSICS AND COSMOLOGY	4510
COSMIC RADIATION	4510
STARS	4510
QUASI-STELLAR, RADIO, AND X-RAY SOURCES	4511
SOLAR PHENOMENA	4511
GALAXIES	4513
COSMOLOGY	4513
PLANETARY PHENOMENA	4513
ATMOSPHERIC PHYSICS	4514
AURORAL AND IONOSPHERIC PHENOMENA	4514
MAGNETOSPHERIC PHENOMENA	4515
ATOMIC, MOLECULAR, AND CHEMICAL PHYSICS	4515
BEAMS AND THEIR REACTIONS	4516
ATOMIC AND MOLECULAR PROPERTIES	4516
POSITRONIUM, MUONIUM, AND MUONIC AND MESIC ATOMS AND MOLECULES	4417
COLLISION PHENOMENA	4518
ATOMIC AND MOLECULAR THEORY	4520
GENERAL FLUID DYNAMICS	4520
MAGNETOHYDRODYNAMICS	4520
SUPERFLUIDITY	4520
OTHER QUANTUM FLUIDS	4521
PARTICLE INTERACTIONS AND PROPERTIES - EXPERIMENTAL	4521
ELECTROMAGNETIC INTERACTIONS	4521
WEAK INTERACTIONS	4522
STRONG BARYON-INDUCED INTERACTIONS	4522
STRONG MESON-INDUCED INTERACTIONS	4523
PARTICLE INTERACTIONS AND PROPERTIES - THEORETICAL	4524
GENERAL	4524
ELECTROMAGNETIC INTERACTIONS	4525
WEAK INTERACTIONS	4526
STRONG INTERACTIONS, GENERAL	4527
STRONG INTERACTIONS, BARYON NO.=0	4527
STRONG INTERACTIONS, BARYON NO.=1	4527
STRONG INTERACTIONS, BARYON NO. GREATER THAN 1	4528
PARTICLE INVARIANCE PRINCIPLES AND SYMMETRIES	4529
GENERAL	4529
APPLICATIONS TO ELECTROMAGNETIC AND WEAK INTERACTIONS	4529
APPLICATIONS TO STRONG INTERACTIONS	4529
FIELD THEORY	4529
SCATTERING THEORY	4531
PHYSICS RESEARCH (CONT.)	4532
NUCLEAR PHYSICS	4532
EXPERIMENTAL TECHNIQUES	4532
NUCLEAR PROPERTIES AND REACTIONS, A=1-5, THEORETICAL	4532
MASS, ABUNDANCE, AND BINDING ENERGY	4532
NUCLEAR REACTIONS AND SCATTERING	4532
NUCLEAR PROPERTIES AND REACTIONS, A=1-5, EXPERIMENTAL	4532
NUCLEAR REACTIONS AND SCATTERING	4532
NUCLEAR PROPERTIES AND REACTIONS, A=6-19 THEORETICAL	4533
MASS, ABUNDANCE, AND BINDING ENERGY	4533
ENERGY LEVELS AND TRANSITIONS	4533
NUCLEAR REACTIONS AND SCATTERING	4533
NUCLEAR PROPERTIES AND REACTIONS, A=6-19, EXPERIMENTAL	4533
MASS, ABUNDANCE, AND BINDING ENERGY	4533
RADIOACTIVE DECAY	4533
ENERGY LEVELS AND TRANSITIONS	4533
NUCLEAR REACTIONS AND SCATTERING	4533
NUCLEAR PROPERTIES AND REACTIONS, A=20-38, THEORETICAL	4534
NUCLEAR REACTIONS AND SCATTERING	4534
NUCLEAR PROPERTIES AND REACTIONS, A=20-38, EXPERIMENTAL	4534
ENERGY LEVELS AND TRANSITIONS	4534
NUCLEAR REACTIONS AND SCATTERING	4535
NUCLEAR PROPERTIES AND REACTIONS, A=39-58, THEORETICAL	4535
MASS, ABUNDANCE, AND BINDING ENERGY	4535
NUCLEAR REACTIONS AND SCATTERING	4535
NUCLEAR PROPERTIES AND REACTIONS, A=39-58, EXPERIMENTAL	4536
RADIOACTIVE DECAY	4536
ENERGY LEVELS AND TRANSITIONS	4536
NUCLEAR REACTIONS AND SCATTERING	4536
NUCLEAR PROPERTIES AND REACTIONS, A=59-89, THEORETICAL	4536
NUCLEAR REACTIONS AND SCATTERING	4536
NUCLEAR PROPERTIES AND REACTIONS, A=59-89, EXPERIMENTAL	4536
RADIOACTIVE DECAY	4536

Category	Page
ENERGY LEVELS AND TRANSITIONS	4537
NUCLEAR REACTIONS AND SCATTERING	4537
NUCLEAR PROPERTIES AND REACTIONS, A=90-149, THEORETICAL	4537
MASS, ABUNDANCE, AND BINDING ENERGY	4537
RADIOACTIVE DECAY	4537
ENERGY LEVELS AND TRANSITIONS	4537
NUCLEAR REACTIONS AND SCATTERING	4537
NUCLEAR PROPERTIES AND REACTIONS, A=90-149, EXPERIMENTAL	4538
RADIOACTIVE DECAY	4538
ENERGY LEVELS AND TRANSITIONS	4538
NUCLEAR REACTIONS AND SCATTERING	4538
NUCLEAR PROPERTIES AND REACTIONS, A=150-189, EXPERIMENTAL	4538
ENERGY LEVELS AND TRANSITIONS	4538
NUCLEAR REACTIONS AND SCATTERING	4539
NUCLEAR PROPERTIES AND REACTIONS, A=190-219, EXPERIMENTAL	4539
RADIOACTIVE DECAY	4539
ENERGY LEVELS AND TRANSITIONS	4539
MOMENTS AND SPIN	4539
NUCLEAR REACTIONS AND SCATTERING	4539
SPONTANEOUS AND INDUCED FISSION	4540
NUCLEAR PROPERTIES AND REACTIONS, A=220 AND ABOVE, THEORETICAL	4540
MASS, ABUNDANCE, AND BINDING ENERGY	4540
NUCLEAR REACTIONS AND SCATTERING	4540
SPONTANEOUS AND INDUCED FISSION	4540
NUCLEAR PROPERTIES AND REACTIONS, A=220 AND ABOVE, EXPERIMENTAL	4540
MASS, ABUNDANCE, AND BINDING ENERGY	4540
RADIOACTIVE DECAY	4540
ENERGY LEVELS AND TRANSITIONS	4541
NUCLEAR REACTIONS AND SCATTERING	4541
SPONTANEOUS AND INDUCED FISSION	4541
NUCLEAR THEORY	4541
NUCLEAR STRUCTURE	4541
NUCLEAR MATTER	4542
NUCLEAR REACTIONS AND SCATTERING	4543
NUCLEAR MOMENTS AND SPIN	4544
SPONTANEOUS AND INDUCED FISSION	4544
NUCLEAR MODELS	4544
RADIATION AND SHIELDING PHYSICS	4544
RADIATION PHYSICS	4544
SHIELDING CALCULATIONS AND EXPERIMENTS	4545
NEUTRON INTERACTIONS WITH MATTER	4545
MEDICAL PHYSICS	4546
RADIATION PROTECTION STANDARDS	4546
RADIATION SOURCE CALIBRATION AND STANDARDIZATION	4546
DOSIMETRY	4546
SOLID STATE PHYSICS	4547
SUPERCONDUCTIVITY	4547
GENERAL THEORY	4547
ACOUSTIC, ELECTRIC, MAGNETIC, OPTICAL, AND THERMAL PHENOMENA	4548
THEORETICAL PHYSICS	4548
CLASSICAL AND QUANTUM MECHANICS	4548
RELATIVITY AND GRAVITATION	4549
ACOUSTICS	4549
OPTICS	4549
STATISTICAL PHYSICS AND THERMODYNAMICS	4550
MATHEMATICAL PHYSICS	4550
FUSION ENERGY	4550
PLASMA RESEARCH	4550
PLASMA CONFINEMENT AND HEATING	4550
PLASMA DIAGNOSTICS	4553
PLASMA KINETICS - GENERAL	4555
PLASMA KINETICS - EXPERIMENTAL	4555
PLASMA KINETICS - THEORETICAL	4556
PLASMA PRODUCTION	4559
PLASMA INSTABILITIES	4560
PLASMA WAVE PHENOMENA	4563
FUSION POWER PLANT TECHNOLOGY	4567
BLANKET ENGINEERING	4567
MAGNET COILS AND FIELDS	4568
HEATING AND FUELING SYSTEMS	4569
POWER CONVERSION SYSTEMS	4569
INERTIAL CONFINEMENT TECHNOLOGY	4569
COMPONENT DEVELOPMENT AND MATERIALS TESTING	4571
GENERAL AND MISCELLANEOUS	4572
MATHEMATICS AND COMPUTERS	4572
INFORMATION HANDLING	4573
CORPORATE INDEX	1C
AUTHOR INDEX	15A
SUBJECT INDEX	55S
REPORT NUMBER INDEX	163R
CONTRACT NUMBER INDEX	159CN

STAFF OF ENERGY RESEARCH ABSTRACTS

Editor and Production Manager
David E. Bost

Assistant Editor
Lee M. Thompson

Associate Editors
M. Catherine Grissom
Robert C. Kelly
Sidney F. Lanier
Henry D. Raleigh
Lila B. Smith
Charles E. Stuber

Report Evaluators
William D. Matheny
John H. Mitchell
Mary H. Newman
Ted Redmon

Descriptive Cataloging Specialist
J. Paul Meredith

Subject Heading Specialist
Dora H. Moneyhun

Corporate Author Specialist
Mickey M. Moore

Report Number Specialist
M. Gwen Gaither

Computer Processing Coordinator
Noboru Kawakami

Information Specialists
P. Martin Alexander
E. Ray Bedford
Jack Blanshei
Jane G. Buchanan
D. Lamar Cason
David C. Cunningham
Theodore F. Davis
James R. Dulaney
Darrell O. Galde
Carolyn D. Houston
Dona C. Keller
Lynda H. Kern
W. Hugh Kinser
Lisbeth C. Lieberman
Betty L. McDowell
Lorne T. Newman
Jean F. Peckham
Mona H. Raridon
Julia S. Redford
Frances Roddy
Jessie W. Rushing
Robert W. Rutkowski
Francis L. Sachs
Polly C. Summers
George H. Thoeming
Helen L. Ward
Milton O. Whitson
Martha C. Wilson

Publishing Coordinator
Charles R. Bruce

Communication concerning the editorial policy and content of *Energy Research Abstracts* should be addressed to the Editor, *Energy Research Abstracts*, Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

The Secretary of the U. S. Department of Energy has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1978.

Volume 3, Number 19, October 15, 1978

ENERGY RESEARCH ABSTRACTS

COAL AND COAL PRODUCTS

REFER ALSO TO CITATION(S) 44863, 44886

44021 (ORNL—5387) **Fossil energy program. Quarterly progress report for the period ending December 31, 1977.** McNeese, L.E. (Oak Ridge National Lab., Tenn. (USA)). May 1978. Contract W-7405-ENG-26. 234p. Dep. NTIS, PC A11/MF A01.

Progress is reported on research and development projects that are carried out in support of the increased utilization of coal and other fossil fuel alternatives to oil and gas as sources of clean energy. These projects are supported by the DOE Divisions of Coal Conversion; Power Systems; Oil, Gas, and In Situ Technology; Program Control and Support; Basic Energy Sciences; and Biomedical and Environmental Research, and by the EPA Office of Research and Development through Interagency agreement with the DOE.

44022 Joint research work in the field of coal refining is carried out by the German coal mining industry. Peters, W. *Coal Miner;* **2**: No. 2, 11-18(Jun 1977).

In the German coal mining industry, joint research has a long and successful tradition. The main body carrying out the joint research work is the Steinkohlenbergbauverein, established and financed by all coal mining companies in the Federal Republic of Germany. A review is presented of coal refining and utilization research conducted by the organization, specifically coal preparation, coking, electricity generation, gasification, liquefaction, coal chemistry, and environmental effects.

PROCESSING

44023 Some directions of the technological processing of coals. Privalov, V.E. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 1-5(1976).

Modern methods of processing coal for use as fuels and chemical or other products, by hydrogenation, gasification, thermal dissolution, thermal plasticization, and carbonization are discussed. Most of the information is derived from foreign literature.

CARBONIZATION

REFER ALSO TO CITATION(S) 44060, 44084

44024 Present state of coking technology and development trends. Fiedler, J. *Bergbau;* **28**: No. 9, 330-341(Sep 1977). (In German).

Since the beginning of the 60ies, the technological progress achieved in conventional coking in a horizontal chamber coking oven has been characterized worldwide by a further development of the service-proved large capacity coke oven. The trend is to construct nearly without exceptions large capacity coke ovens on new plants, and the demand for emission abatement for coke ovens has set coking technoligies going after a long period of stagnation. The shortage of coking coal has required new methods for the generation of high-quality blast furnace coke on a broadened coal basis. Apart from compression, bulk coking of predried and preheated coal has been developed.

44025 Coking furnace. Gregor, K.; Asmus, K. (to Gewerkschaft Schalker Eisenhuette Maschinenfabrik, Gelsenkirchen (Germany, F.R.)). German(FRG) Patent 2,365,468/C/. 7 Jul 1977. 3p. (In German).

The invention concerns a coking furnace with several horizontal coking chambers, which is equipped with coking mass transport trucks, a coke quenching truck and a hood covering all the area to extract gases and dust. As the sealing of the parts having relative movement is considerably more difficult than for stationary parts and requires much greater suction power to keep the environment clean, it is proposed not to move the coke quenching truck during the expulsion phase. The distribution of the glowing coke in the quenching truck takes place by a distribution device, preferably a travelling grate.

44026 Equipment to carbonize fine-grained fuels. Grams, W.; Gernhardt, P.; Peter, K.; Danguillier, W.; Hundeshagen, C.; Pohl, S. (to Otto (C.) und Co. G.m.b.H., Bochum (Germany, F.R.)). German(FRG) Patent 2,512,500/A/. 7 Oct 1976. 9p. (In German).

The invented carbonization equipment was developed with the aim to obtain a tar-poor low-temperature carbonization coke with a suitable grain size for subsequent solid-bed gasification, from all types of bituminous coal. The coal is degassed between oppositelying, continually downward-moving plates forming a gap. The plates, which form a continuous belt via upper and lower drive or tail pulleys are heated with gas at a height of 2 to 3 m. The gap width is about 10 to 30 mm. The whole system is in a container with pressure of preferably 0.4 to 40 bar. A part-flow of the clear gas obtained from a gas producer connected to one of the carbonization devices in flowed through in counter-current to the carbonized product to heat it. Instead of fine-grained bituminous coal or brown coal, old rubber, plastic wastes or domestic waste can be used in the new equipment after appropriate grinding and processing.

44027 Addition of lean coals to charges with an increased content of gas coals of the Western Donbass. Elenskii, F.Z.; Chernyshov, Yu.A.; Belichenko, A.G.; Glebova, N.A. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 86-90(1976).

The sensitivity of various methods of determining cakeability as applied to charges with added lean coals has been checked. The properties of charges with high amounts of gas coals and the addition of lean coals to them have been studied, and the quality of the coke has been investigated. Recommendations are given in relation to the amount of lean coals to be added to charges with high contents of Western Donbass gas coals.

DESULFURIZATION AND PURIFICATION

REFER ALSO TO CITATION(S) 44122, 44123, 44126

44028 (FE—2579-13) **Granular bed filter development program. Quarterly report, July—September 1977.** Phillips, K.E. (Combustion Power Co., Inc., Menlo Park, Calif. (USA)). Dec 1977. Contract EF-77-C-01-2579. 41p. Dep. NTIS, PC A03/MF A01.

Improvements in the theories of collection mechanisms, resulting from revised filtration coefficients developed by consultant Professor Goren during recent experimental work, have been incorporated in a revised set of equations for the mathematical model. The computer model has been updated to incorporate the latest iteration in the filtration equations and codes for collection mechanisms of three different sizes of particulate. Extensive correlation checks of computer solutions corresponding with a representative test on the cold-flow GBF have been conducted. A report entitled "Particle Sampling Facility Operation", was released. It summarized the particle sampling techniques and procedures developed for use. All of the cold-flow tests scheduled were conducted as planned. Only nine tests, using small media, remain to be run for completion of all 104 tests required under this task. A report entitled "Filter Front Face Cleaning Experiments" was released. It summarized all work performed by CPC to date in developing methods to inhibit

inlet screen deposition and results of tests with three types of deposit-removal devices.

44029 (IS-ICP—48) **Desulfurizing coal with solutions containing dissolved oxygen.** Tai, C.Y.; Graves, G.V.; Wheelock, T.D. (Iowa State Univ. of Science and Technology, Ames (USA). Energy and Mineral Resources Research Inst.). Sep 1977. 21p. (CONF-770814—14). Dep. NTIS, PC A02/MF A01.

From American Chemical Society meeting; Chicago, IL, USA (29 Aug 1977).

Dilute alkaline solutions containing oxygen dissolved under pressure were very effective at elevated temperatures for extracting the inorganic sulfur from coal. Of various alkalis tested, sodium carbonate gave the best results. This material also has the advantages of being readily available, low in cost, and relatively noncorrosive in aqueous solution towards steel and other common materials of construction. Although sufficient alkali should be used to neutralize all of the acid which is produced through oxidation of the coal sulfur, an excessive concentration of alkali seems to slow the rate of desulfurization. On the other hand, the rate of desulfurization can be increased by reducing the size of the coal and/or pyrite particles. Leaching coal fines with dilute sodium carbonate solutions at temperatures up to 150°C and with oxygen partial pressures up to 5 atm for up to 2 hr does not seem to degrade high volatile bituminous coal. However, the coal does adsorb sodium from the leach solution which can be removed subsequently by washing with dilute acid. Chemical leaching can be combined advantageously with physical cleaning since the latter is more adept at removing coarser particles of pyrite while the former is more adept at removing the microscopic particles.

44030 (IS-ICP—51) **Action of aqueous alkali on pyrite.** Bunn, R.L. (Iowa State Univ. of Science and Technology, Ames (USA). Energy and Mineral Resources Research Inst.). Feb 1978. 153p. Dep. NTIS, PC A08/MF A01.

Thesis.

The effect of aqueous sodium hydroxide solutions on coal derived pyrites was investigated in a packed bed reactor. The ranges of the variables used in the investigation were: temperature from 250 to 420°F; particle size from 69 to 335 micron; concentration from 0 to 10 percent; particle Reynolds number from 15 to 75. At the conditions used, the reaction is chemically controlled with an apparent activation energy of 21 kcal/mole and a frequency factor of 1.45 x 10^4/cm/sec. The reaction rate is linear in sodium hydroxide concentration. No significant trends are evident with variations in particle Reynolds number. Particle size variations gave results consistent with a porous particle—shrinking core chemical reaction controlled model. The reaction products affect the rate of sulfur extraction causing a significant rate maximum to occur at low levels of product concentration in the liquid phase. Evidence suggests that a surface complex forms during the reaction, causing an induction period to be observed. Suggestions regarding the chemistry of the reaction are based upon the experimental observations. Comparative data were generated with the same apparatus on the reaction of sodium carbonate both with and without oxygen added. The rate of reaction on pyrite of sodium carbonate, with oxygen added, is comparable or superior to the results with sodium hydroxide. The data presented establish the significant kinetic parameters in relation to the use of sodium hydroxide solutions as a means of removing pyritic sulfur from coal. The specific rates of sulfur removal presented can be used for predicting reactor behavior subject to the limitations of the range of the variables studied. The data also provide insight into the fundamental character of the reaction of pyrite with alkaline solutions.

44031 (PNL—2040-9) **Process for cleaning and removal of sulfur compounds from low Btu gases. Quarterly summary report, January—March 1978.** Moore, R.H.; Ham, D.G.; Mitchell, D.H.; Robertus, R.J.; Stegen, G.E. (Battelle Pacific Northwest Labs., Richland, Wash. (USA)). Apr 1978. Contract EY-76-C-06-1830. 22p. Dep. NTIS, PC A02/MF A01.

In this phase of work the Process Development Unit (PDU) is to be remodeled by incorporation of appropriate subsystems to permit operation in continuous process mode. Evidence has accumulated which indicated the Na_2CO_3 - K_2CO_3 - Li_2CO_3 ternary eutectic containing appreciable sulfide ion is much more corrosive than similar systems containing appreciable added $CaCO_3$. It is concluded this is due to the tendency of Ca^{++} to combine with S^{--} to reduce the thermodynamic activity of the latter. The lowered S^{--} activity results in lessened corrosivity. $CaCO_3$ will be added at 20 mole percent to salt compositions employed in future PDU runs. Equipment failure experience and plugging due to corrosion products is detailed and proposed methods of alleviating the problems are described.

44032 **Method to desulphurize coal.** Guth, E.D.; Diaz, A.F. (to KVB Engineering, Inc., Tustin, Calif. (USA)). German(FRG) Patent 2,513,602/A/. 7 Oct 1976. 29p. (In German).

Powdered coal of grain size up to 6 mm is treated with a gas mixture of O_2, N_2, NO and NO_2 in a fluidized bed reactor for about 20 minutes or in a batch reactor up to 5 hours at temperatures between 40 and 260°C. The pyrite sulphur is converted under the oxidizing effect of NO_2 to $FeSO_4$ and sulphur oxides, the organic bonded sulphur to sulphoxides, sulphones and sulphur oxides. The gaseous sulphur oxides are removed from the gas by contact with alkali or alkali earth metal oxides or hydroxides or NH_4OH forming sulphates. The iron sulphate is separated from the coal by washing with water, the sulphoxides and sulphones are converted to sodium sulphite with 10% caustic soda solution and which are also washed out with water. It is shown by means of examples that 87% desulphurization can be achieved with the method whereby the sulphur is collected as commercially usuable end-product, i.e. sulphate or sulphuric acid.

HYDROGENATION

REFER ALSO TO CITATION(S) 44069

44033 (FE—2305-3) **Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly report, July—September 1976.** Cronauer, D.C.; Jewell, D.M.; Boyle, J.P. (Gulf Research and Development Co., Pittsburgh, Pa. (USA)). Oct 1976. Contract EX-76-C-01-2305. 15p. Dep. NTIS, PC A02/MF A01.

The initial stages of research in the study of hydrogen transfer in coal hydrogenation are described. Preliminary experiments in the transfer of hydrogen from a donor tetralin, to a potential acceptor, phenanthrene, have been completed. The amount of transfer was low, but interesting side reactions were observed. The procurement of tagged compounds and the evaluation of analytical test procedures is progressing on schedule. Plans called for the use of asymmetric octahydrophenanthrene as one of the model donor compounds, but it has been replaced with the symmetric isomer due to stability considerations.

44034 **Method for the hydrogenating extraction of coal.** Martin, T.G. (to Coal Industry (Patents) Ltd., London (UK)). German(FRG) Patent 2,555,190/A/. 1 Jul 1976. 14p. (In German).

The invention deals with a method for the hydrogenation extraction of finely divided coal at raised temperature using a gaseous solvent in the supercritical region and in the presence of a partly hydrogenated aromatic compound (e.g. tetraline) as hydrogen donor, dissolved in the solvent. The hydrogen donor or its dehydrogenated products could be removed together with the coal extract from the extraction zone with the supercritical gas phase and be recycled after regeneration into the extraction process. The extracted materials are condensed out of the gaseous or vapour gas-phase extract after separation from the solid residue. The extraction takes place at 380-440°C in a time of 3 minutes to 2 hours. The amount of solvent used should be less than ten-fold the weight of the coal. The dependence of the extraction yield on solvent (mostly toluene) and amount of hydrogen donor, as well as on heating rate and extraction temperature, is illustrated in various examples (yields to almost 40%).

GASIFICATION

REFER ALSO TO CITATION(S) 44067, 44072, 44073, 44085, 44135, 44607, 45053

44035 (FE—1527-43(Vol.2)) **Gas generator research and development: TRI-GAS process. Volume II. Appendix. Sections I through V. Final report, August 21, 1973—October 20, 1977.** (Bituminous Coal Research, Inc., Monroeville, Pa. (USA)). May 1978. Contract EX-76-C-01-1527. 99p. (BCR-L—886(Vol.2)). Dep. NTIS, MF A01.

Portions of document are illegible.

44036 (FE—1527-43(Vol.3)) **Gas generator research and development: TRI-GAS process. Volume III. Appendix. Sections VI through XIV. Final report, August 21, 1973—October 20, 1977.** (Bituminous Coal Research, Inc., Monroeville, Pa. (USA)). May 1978. Contract EX-76-C-01-1527. 240p. (BCR-L—886(Vol.3)). Dep. NTIS, MF A01.

Portions of document are illegible.

44037 (FE—1545-44) **Environmental considerations for low-Btu gasification of coal for electric power generation.** Hale, G.L.; Mohn, N.C.; Smolenski, J.V. (Combustion Engineering, Inc., Windsor, Conn. (USA)). Aug 1977. Contract EX-76-C-01-1545. 122p. Dep. NTIS, PC A06/MF A01.

An investigation was made to determine whether Combustion Engineering's 5-ton per hour Process Development Unit, as well as scaled-up commercial versions of this low-Btu coal gasification plant, would comply with Federal, State, and local environmental regulations. Inherent and potential solid, liquid, gaseous, and trace element emissions were examined from the standpoint of: anticipat-

ing concentrations and calculating effluent stream rates; making recommendations to reduce or minimize adverse environmental effects; and making recommendations for control and disposal of effluents.

44038 (FE—1794-25) **Development of a continuous dry coal screw feeder: Phase II. Quarterly technical progress report, April 1, 1977—June 30, 1977.** Mistry, D.K. (Ingersoll-Rand Research, Inc., Princeton, N.J. (USA)). Jul 1977. Contract EX-76-C-01-1794. 54p. Dep. NTIS, PC A04/MF A01.

The 1.5″ diameter screw feeder (NB V-12) development testing progressed satisfactorily. Several conclusions were drawn. With external heat operation: Only a minor portion of the total power (energy) is consumed mechanically in driving the screw; a large amount of energy is used to heat the coal and evaporate moisture in the input coal; operation without a conical tip at the screw discharge end yields better performance in comparison with the conical tip; the overall performance of an increasing volume screw is slightly better than that of ¾ pitch length screw (the ¾ pitch length screw requires substantially more mechanical specific power in comparison with the increasing volume screw); and the injection mode yields slightly better performance and is less sensitive to the screw configuration in comparison with the extrusion mode. Without external heat operation: The coal output is essentially independent of gas back-pressure and is directly proportional to the cycle rate in injection mode; the feeder operation is independent of the coal properties at elevated temperature and hence this operation offers considerable advantage over that with external heat operation. The shakedown testing of the 5.5″ diameter screw feeder and its test system continued. The tests to date have provided valuable information for design alterations to the feeder and system which should greatly improve overall operation; however, it has delayed the program.

44039 (FE—2036-21) **Liquid phase methanation pilot plant installation and operation. Quarterly report, October 1, 1976—December 31, 1976.** (Chem Systems, Inc., New York (USA)). Mar 1977. Contract EX-76-C-01-2036. 28p. Dep. NTIS, PC A03/MF A01.

The LPM Pilot Plant was delivered to Institute of Gas Technology's HYGAS Plant in Chicago, Illinois. The unit was reassembled and check-out began on all mechanical, electrical and instrumentation systems. Additional steam tracing and insulation was added to the plant to insure continuity of operation even in severe weather conditions. Pressure testing began and a cold oil circulation test was started to check out operation of equipment and instrumentation. Laboratory support work continued at Chem Systems' Hackensack, New Jersey research laboratory. Three new catalyst formulations were tested in the Process Development Unit (PDU). A new process liquid with a low pour point (-35°F) was also tested in the PDU and found satisfactory for use in the pilot plant. The bench scale unit was run with a synthesis gas simulating the gas that will be obtained from IGT's steam-methane reformer (H_2/CO ratio = 6/1). The pilot plant experimental program was modified to make use of this auxiliary gas when the Hygas Plant was not delivering coal-derived synthesis gas.

44040 (FE—2036-24) **Liquid phase methanation pilot plant operation and laboratory support work. Quarterly report, October 1, 1977—December 31, 1977.** (Chem Systems, Inc., New York (USA)). Jan 1978. Contract EX-76-C-01-2036. 37p. Dep. NTIS, PC A03/MF A01.

Evaluation of data from pilot plant Run No. 4 resulted in the decision to modify the gas and oil feed systems to improve flow distribution within the reactor. A catalyst support screen was designed with a central hole and plug for catalyst withdrawal. The oil sparger was eliminated and replaced with a disperser plate. Gas sparger holes were decreased to half their cross-sectional area. Laboratory support work consisted of five runs in the Bench Scale Unit and the PDU. An improved Grace CRG-A extrudate catalyst was the subject of these tests since it is intended to try this catalyst in the pilot plant. When the catalyst was reduced as recommended by the manufacturer, results indicated an unusually high activity, but poor physical strength. At lower reduction temperatures, the catalyst exhibited an activity comparable to other catalyst candidates and the physical strength was greatly improved. Further testing is necessary, to verify an optimum reduction procedure so that plugging of reactor and filters due to catalyst disintegration does not occur, before the catalyst can be utilized in the pilot plant. Construction of the experimental unit for studying rates of carbon formation continued. The skid, consisting of five identical reactor systems, a master control panel, a gas booster compressor module and an analytical unit, is nearly completed.

44041 (FE—2218-11) **Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976—June 1977.** Anderson, E.M. (Babcock and Wilcox Co., Lynchburg, Va. (USA). Materials and Chemical Technology Lab.). Nov 1977. Contract EX-76-C-01-2218. 122p. Dep. NTIS, PC A06/MF A01.

The report reviews the results obtained on the first lined vessel after two thermal cycles—one to 1200 F and the other to 2000 F—and the preparations made and procedures used to run these tests. The report also discusses the problems experienced with the heaters and mold forms and the actions taken or planned to correct these problems.

44042 (FE—2355-2(Rev.E)) **Coal gasification valves: Phase II. Quarterly technical progress report, September 1977—November 1977.** Harper, C. (Consolidated Controls Corp., El Segundo, Calif. (USA)). Jan 1978. Contract EX-76-C-01-2355. 40p. Dep. NTIS, PC A03/MF A01.

Portions of document are illegible.

The primary goals of the second quarter of Phase II was to continue effort on (1) component test and evaluation, (2) prototype analysis and final design, (3) fabrication, assembly, and test of the Type III valve, and (4) preparation of the test procedure and acquisition of tools and fixtures for development testing of the Type III valve. Basically, these goals have been met and the program is on schedule.

44043 (FE—2414-6) **Remote electromagnetic sensing of underground coal burns. Quarterly technical report, September—November 1977. Interim annual report.** Quincy, E.A. (Wyoming Univ., Laramie (USA). Dept. of Electrical Engineering). Dec 1977. Contract EX-76-S-01-2414. 55p. Dep. NTIS, PC A04/MF A01.

The main objective of this research project is to develop and field test an induction system and estimator algorithm for remote determination (at the surface) of the location, shape and size of underground coal burns. This report contains an Interim Annual Report followed by the 2nd Quarterly Report. Wideband induction responses were obtained on 4 traverses over Hanna II, Phase 2 and 3 during August 1977. These data have been computer processed to obtain 3-dimensional time and frequency response maps. These correlated well with chemical estimates of the burn location. The effects of horizontal pipes were simulated by adding conducting wire between wells. A computer program was developed for an induction system secondary response during a traverse over a buried metal sphere model of an underground coal burn. Peak response along the traverse was shown to be in good agreement with those previously computed for rectangular boxes. Dual parameter Bayes estimators were developed in closed form employing a quadratic cost function. Performance expressions were also obtained in closed form for the variance and mean square error.

44044 (FE—2416-20) **Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977—October 28, 1977.** (Badger Plants, Inc., Cambridge, Mass. (USA)). 4 Jan 1978. Contract EX-76-C-01-2416. 14p. Dep. NTIS, PC A02/MF A01.

An analysis of the work accomplished during this period establishes the following conclusions: (1) Indications are promising that injection extruders can be developed within the next two years to feed dry coal and lime up to system pressures of 1,000 psig. A feeder capacity of 100 tons per hour seems to be within practical limits. (2) The emergency relief and venting system for the commercial plant is primarily handled by three 200-foot flare stacks for each gasifier train. (3) The results of preliminary studies warrant further investigation into the possibilities of marketing carbon dioxide and nitrogen as salable by-products. (4) Assuming the proposed commercial plant is located in Southern Appalachia, it is more attractive to purchase the required power instead of onsite power generation. (5) The Methanol-to-Gasoline conceptual design study is proceeding based on the following schemes: Gasoline plus by-product LPG; gasoline plus by-product LPG and high Btu gas; and maximum gasoline. Schemes A and C will be integrated with the Coal-to-Methanol complex whereas Scheme B is simply added to the back-end of the Methanol Complex.

44045 (FE—2469-17) **Experimental program for the development of peat gasification. Interim report No. 3. Coiled tube reactor experiments.** (Institute of Gas Technology, Chicago, Ill. (USA)). Jan 1978. Contract EX-76-C-01-2469. 46p. Dep. NTIS, PC A03/MF A01.

This interim report presents the results of 28 peat hydrogasification tests conducted in a dilute-phase, short-residence time (a few seconds) coiled-tube reactor to determine the effects of temperature (850° to 1500°F) and hydrogen partial pressure (0 to 1000 psia) on product distribution and yields. In general, the results show that many features of peat hydrogasification are qualitatively similar to those of lignite and higher rank coals. However, the quantitative and kinetic characteristics of peat gasification are quite unique. Therefore, the process concept most advantageous for converting peat to SNG is different from those which are most suitable for gasifying coals. The tests show that the carbon converted directly to hydrocarbon gases in a short-residence-time hydrogasifier is up to four times as high for peat as for lignite. Therefore, a single hydrogasifi-

cation stage will be adequate for converting peat to SNG and a high yield of hydrocarbon gases is obtained at relatively low hydrogen partial pressures. Another unique feature of peat hydrogasification is that temperature is very effective in controlling relative yields of gas and oil. The data obtained have been quantitatively analyzed and a peat-gasification model has been developed. Based on the laboratory test results, a preferred configuration for gasifying peat has been selected and named a PEATGAS reactor. It incorporates a dilute-phase, concurrent, short-residence time hydrogasifier and a fluidized-bed, nonslagging, char gasifier with oxygen. Currently, process development unit tests are under way with the objective of determining the effects of initial scale-up from laboratory to PDU-scale.

44046 (FE—2518-14) **Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification.** Sprouse, K.M. (Rockwell International Corp., Canoga Park, Calif. (USA). Rocketdyne Div.). Dec 1977. Contract EX-77-C-01-2518. 59p. Dep. NTIS, PC A04/MF A01.

The following discussions and analyses present a detailed description of pulverized coal conversion in entrained flows. The basic formulations are broken into two main categories, one describing entrained flow reactor dynamics, and the other only coal particle chemistry itself. In the first category on entrained flow reactor dynamics, the physical and chemical descriptions common to all reactors regardless as to whether or not their function is gasification, liquefaction, or combustion will be presented. However in the second category on coal particle chemistry, only those descriptions concerned with devolatilization and hydrogasification are given. Finally, the discussions end by describing the methodology by which the developed equations are solved. These formulations contain physical and chemical descriptions that have not been included in previous mathematical models for pulverized coal entrained flow reactors. Therefore, the range of operating conditions over which this model can apply should be extended beyond those currently used today in determining reactor performance.

44047 (FE—2666-2) **Mixing and gasification of coal in entrained flow systems. Quarterly technical progress report No. 2, July 1—September 30, 1977.** Smoot, L.D.; Hanks, R.W.; Hedman, P.O. (Brigham Young Univ., Provo, Utah (USA). Dept. of Chemical Engineering). 15 Oct 1977. Contract EF-77-S-01-2666. 29p. Dep. NTIS, PC A03/MF A01.

This report summarizes work accomplished during the second quarter of a study to investigate mixing and gasification of coal in entrained flow systems. Eight additional cold-flow tests were conducted using an intermediate-size test chamber. The results verify that mixing chamber size is a secondary factor in controlling gas-particle mixing rates. Modification of this facility to permit nonparallel injection with recirculation was initiated. The basic gasifier facility was completed and gas flames were ignited and stabilized on several occasions. Difficulties in obtaining uniform coal feed rates were encountered and alteration of the coal feeder was initiated to resolve these difficulties. Design and fabrication of a prototype of the sample train for removing gas-coal samples from the gasifier was also completed and is being tested. It was shown that water does not alter coal or char samples but does dissolve some of the soluble ingredients in ash. Application of the one-dimensional computer code to entrained gasifiers was initiated. Two computations for the laboratory gasifier illustrated the importance of the mixing process and showed that char-CO_2 reactions are slow compared to devolatilization and oxidation of the volatiles. Integration of general gasifier components into the computer model was continued. The technical basis of the model was improved by accounting for micromixing processes. Sample calculations were completed for the laboratory gasifier. It is anticipated that test work for coal-steam-oxygen flames will be initiated during the next report period.

44048 (FE—2729-1) **Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20—December 20, 1977.** Bartholomew, C.H. (Brigham Young Univ., Provo, Utah (USA)). 5 Jan 1978. Contract EF-77-S-01-2729. 45p. Dep. NTIS, PC A03/MF A01.

From the literature, three major catalyst problems are apparent which relate to stability: sulfur poisoning, carbon deposition with associated plugging, and sintering. Our understanding of these problems is at best sorely inadequate, and the need to develop new and better catalyst technology is obvious. Nevertheless, there has been very little research dealing with new catalyst concepts such as bimetallic (alloy) or monolithic-supported catalysts for methanation. This study deals specifically with sulfur poisoning, carbon deposition, and the effects of support (monolith and pellet) geometry on the performance of alloy methanation catalysts. The effects of carbon deposition and in-situ exposure to 10 ppM H_2S during reaction on the methanation activity of pelleted and monolithic alumina-supported Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh, and Ni-Ru were investigated. These and other significant results are presented and discussed.

44049 (FE—3800-13) **Materials research for clean utilization of coal. Quarterly progress report, July—September 1977.** Schneider, S.J. (National Bureau of Standards, Washington, D.C. (USA). Inst. for Materials Research). 1977. Contract EA-77-A-01-6010-002. 33p. Dep. NTIS, PC A03/MF A01.

Another system utilizing spray nozzles was installed for the introduction of water into the test chambers for testing the alloy specimens in an oxidizing coal gasification environment. The testing of all scheduled alloys at a strain rate of $1 \times 10^{-6} s^{-1}$ at 450°C (840°F) and 600°C (1100°F) in an oxidizing coal gasification environment containing CO, CO_2, H_2, CH_4, H_2S, and H_2O was completed. The oxidizing environment at 600°C seemed to have a significant effect on 310 SS and Incoloy 800 by further reducing their property values when compared to data for the same alloys tested at 600°C in a helium environment. The effect of the oxidizing environment on the other alloys did not seem to be significant. Modifications to the high pressure/high temperature x-ray apparatus have been completed and x-ray patterns of a neat high-alumina cement bar have been obtained at temperatures up to 1000°C in steam at 1000 psi. In situ studies will commence with atmospheres of 70% H_2O-30% CO_2 and 30% H_2O-70% CO_2. During the past quarter the necessary steam pressure has been obtained in the reaction vessel as well as the temperature necessary to melt most typical coal slags. A temperature gradient was effectively reduced in the transpiration reaction and very good agreement with the literature data was obtained for Na_2Cl_2 vaporization. The Failure Prevention Information Center continued to enlarge its data collection activity. Fifty-four additional reports of operating experiences and failure analyses were received, classified, evaluated and entered into the data base. Final review was completed on two of nine abstract reports and others have progressed toward completion. Direct contact with pilot plant, PDU and failure analysis personnel continued and produced a measureable increase in the rate of data acquisition.

44050 (LA—7277-MS) **High-temperature CO_2/O_2—coal reaction rate experiments.** Wagner, P.; Olsen, J.D.; Wewerka, E.M.; Williams, J.M.; Bertino, J.P.; Vanderborgh, N.E. (Los Alamos Scientific Lab., N.Mex. (USA)). May 1978. Contract W-7405-ENG-36. 16p. Dep. NTIS, PC A02/MF A01.

Reactions of ground New Mexico coals in the temperature region 420 to 603°C in flowing CO_2 and CO_2-O_2 mixtures have been measured. Effects of coal type, surface area, temperature, and gas composition have been investigated and are discussed. Lack of quantitative analytical data on the reaction products have precluded an in-depth interpretation of the results; however, quantitative data suitable for predicting and modeling coal weight loss rates for an oxidative pyrolysis of coal in hot CO_2-O_2 gases, as envisioned in the LASL underground coal gasification process, have been obtained and are reported here.

44051 (SAND—78-0253) **Instrumentation and process control development for in situ coal gasification. Twelfth quarterly report, September—November 1977.** Northrop, D.A. (ed.). (Sandia Labs., Albuquerque, N.Mex. (USA)). Mar 1978. Contract EY-76-C-04-0789. 34p. Dep. NTIS, PC A03/MF A01.

Fielding of a major instrumentation effort has been completed and pretest data have been collected prior to the initiation of the Hanna IV in situ coal gasification experiment. A minicomputer-based, field data acquisition system is operational and will provide on-site data reduction and graphical output for the different instrumentation techniques. A high resolution seismic reflection survey has been performed. Excellent definition of the coal seam was obtained by an areal, three-dimensional analysis and presentation of the amplitude data. A posttest survey will be compared to these results to assess the application of this techique to detecting the extent of in situ coal gasification.

44052 (SAND—78-0653) **Fossil Energy Development Programs. Quarterly report, October 1—December 31, 1977.** Traeger, R.K. (ed.). (Sandia Labs., Albuquerque, N.Mex. (USA)). Apr 1978. Contract EY-76-C-04-0789. 14p. Dep. NTIS, PC A02/MF A01.

Several proposed projects were reviewed and five selected for study. The five projects are: Potential Mapping for Enhanced Oil Recovery Processes, Carbon Dioxide Reduction of Coal Liquid Viscosity, High Energy Gas Fracture, Subsidence During Underground Coal Gasification, and Data Transmission While Drilling. The major part of this quarter was used in selecting and defining the programs.

44053 (TID—27900) **Coal feed system development plan.** (Jet Propulsion Lab., Pasadena, Calif. (USA)). Sep 1977. Contract EF-77-A-01-2616. 46p. Dep. NTIS, PC A03/MF A01.

The coal feed system development program presented in this plan is a continuation of the existing ERDA Coal Feed System Development Program and will provide the technologies necessary to develop and establish competitive feeder options for coal process plant designers. Candidate coal feeders have been assessed on a return-versus-investment basis and compared to first-generation feed-

ers such as lockhoppers and slurry pumps. The result of this assessment was a reduction in the number of second-generation feeders being developed. The specific actions to be taken for further development of the feeders selected--i.e., the centrifugal pump kinetic extruder, linear pocket conveyor, piston (single or rotary) pump, and the screw feeder--are described. In developing the planning strategy, the attributes found to be important in successful federally funded demonstration projects were considered. It was concluded that it would be advisable to involve the equipment decision makers at an early stage. This could be accomplished by forming an advisory committee consisting of architectural engineers, process designers, and utility spokesmen to promote early introduction of the developed feeders. It was also concluded that it would be advantageous to demonstrate selected feeders in coal gasification process pilot plants, if such plants could be made available on a noninterference basis. The construction of a centralized demonstration-scale feeder test facility was also recommended for consideration. A centrally directed effort on common feeder problems could also be beneficial. Several supporting tasks to complement the main stream feeder development efforts have been defined. These include process and feeder system-related tasks pertaining to feeder effects on coal, feeder requirements, process interactions, reliability allocations, and ad hoc activities.

44054 (UCID—17759) **Hydrodynamic modeling of fluidized-bed gasifiers and combustors.** Lyczkowski, R.W.; Gidaspow, D.; Galloway, T.R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 19 Apr 1978. Contract W-7405-ENG-48. 17p. Dep. NTIS, PC A02/MF A01.

Hydrodynamic modeling of fluidized beds is becoming increasingly necessary and important as the urgent need for more sources of energy continues. Present models are missing important design and performance criteria that must be derived and understood before further research can be undertaken. A two-part hydrodynamic code with both cold-bed and hot-bed characteristics could supply the missing criteria. Some suggestions for future research in that direction are offered.

44055 (UCRL—50032-77) **LLL in situ coal gasifiction program. Annual report Fiscal Year 1977, October 1976—September 1977.** Stephens, D.R.; Minkel, K.J. (eds.). (California Univ., Livermore (USA). Lawrence Livermore Lab.). 1 Mar 1978. Contract W-74-05-ENG-48. 49p. Dep. NTIS, PC A03/MF A01.

Our principal efforts were directed toward the gasification phase of Hoe Creek No. 1 and preparation for Hoe Creek No. 2. Before gasification is possible, the native coal bed permeability must be increased. Explosive fracturing was used to prepare the coal bed for Hoe Creek No. 1. During FY 1977, the fractured zone was dewatered; this was followed by several days of air-flow testing. The coal bed was ignited at 16:30 on Oct. 15, 1976, in a forward gasification mode. We had no problems with liquid plugging, but after one day of operation at high pressure (60 psig) and low flow (100 to 200 scfm), a sudden increase in flow to 2000 scfm) and a corresponding drop in pressure indicated that a major obstruction had blown or burned out. After that, temperature measurements placed the major portion of the burn at the top of the coal seam. This override had been predicted by postfracture measurements. Even though the override was severe, the gas quality was relatively high (100 to 150 Btu/scfm). When gasification ended, on Oct. 26, 1976, approximately 130 tons of coal (about 16% of that in the fractured zone) had been consumed. Operationally, the experiment was quite successful, and, although the coal recovery was not as high as originally hoped, we were able to operate in forward gasification with reasonable (73%) thermal efficiency. In Hoe Creek No. 2, we plan to prepare the coal bed with the linked-vertical-well process of reverse combustion. A two-process well design was adopted with well spacings of 60 ft. Most of the burn will be conducted with air, but a short steam-oxygen test is planned. The primary objective of Hoe Creek Experiment No. 2 is to determine the feasibility of reverse-combustion linking in a relatively homogeneous, water-saturated coal seam.

44056 (UCRL—80592) **Hoe Creek II field experiment on underground coal gasification, preliminary results.** Aiman, W.R.; Thorsness, C.B.; Hill, R.W.; Rozsa, R.B.; Cena, R.; Gregg, D.W.; Stephens, D.R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 27 Feb 1978. Contract W-7405-ENG-48. 23p. (CONF-780417—8). Dep. NTIS, PC A02/MF A01.

From Western States Section/Combustion Institute; Boulder, CO, USA (17 Apr 1978).

A second in-situ coal gasification experiment was performed by Lawrence Livermore Laboratory at Hoe Creek in Wyoming. The Linked Vertical Wells scheme for in-situ coal gasification was used. The experiment took 100 days for air flow testing, reverse combustion linking, forward combustion gasification, and post-burn steam flow. Air was used for gasification except for a 2-day test with oxygen and steam. Reverse combustion linking took 14 days at 1.6 m/day. Air requirements for linking were 0.398 Mgmol per meter of link assuming a single direct link. The coal pyrolysed during linking was 17 m^3, which corresponds to a single link 1.0 m in diameter. There was, however, strong evidence of at least two linkage paths. The detected links stayed below the 3 m level in the 7.6 coal seam; however, the product flow from the forward-burn gasification probably followed the coal-overburden interface not the reverse burn channels at the 3 m level. A total of 232 Mgmols (194 Mscf) of gas was produced with heating value above 125 kJ/mol (140 Btu/scf) for significant time periods and an average of 96 kJ/mol (108 Btu/scf). During the oxygen-steam test the heating value was above 270 kJ/gmol (300 Btu/scf) twice and averaged 235 kJ/gmol (265 Btu/scf). The coal recovery was 1310 m^3 (1950 ton). Gasification was terminated because of decreasing product quality not because of burn through. The product quality decreased because of increasing underground heat loss.

44057 Hydrogen or methane: future processes for the production of SNG. Stroud, H.T.F. *Energy Dig. (London) ;* **6**: No. 3, 4-10(Aug 1977).

Possible future processes for the production of SNG from various feedstocks are discussed. The production of a gas which is largely methane appears to be the best way of husbanding resources. Among the processes cosidered are various methods of gasifying coal using nuclear heat.

44058 In-situ gasification of coal. Warren, I.H. *Coal Miner;* **2**: No. 2, 31-34(Jun 1977).

A review and discussion of "Underground gasification of coal: a NCB reappraisal 1976", a National Coal Board report which concludes that although the technique has been developed, albeit spasmodically, in several countries, further trials are required to prove commercial feasibility. New technology presents opportunities for more fruitful developments. Canada's entry into this field of research is seen by the author as an essential step, given the current energy supply picture.

44059 Method to convert coal and water into at least hydrocarbon and system to carry out such a method. Jones, A.R. (to Westinghouse Electric Corp., Pittsburgh, Pa. (USA)). German(FRG) Patent 2,503,367/A/. 4 Sep 1975. 41p. (In German).

The invention deals with a coal gasification method with the aim to produce hydrocarbons making maximum use of H_2 raw material. This is achieved in that coal is not, as usually done, mixed with steam to react, but that water is converted into H_2 and O_2 seperately from the coal, and the hydrogen thus produced is reacted with powdered coal to hydrocarbons. The energy for the splitting of the water in a first chemical reactor is provided by heat exchange with the cooling gas of a high-temperature reactor. The conversion of coal by hydrogen to one or several hydrocarbons takes place in a second chemical reactor. Non-converted coal is converted in a third reactor into CO by means of the oxygen obtained in the water splitting in the first reactor, which in a fourth stage reacts with excess H_2 from the second chemical reactor to give one or several hydrocarbons. The necessary equipment to carry out the process (heat exchangers, chemical reactors and all necessary inlets and outlets) are also part of the invention and are explained in an experimental example.

LIQUEFACTION

REFER ALSO TO CITATION(S) 44033, 44044, 44049, 44052, 44135

44060 (FE—1800-21) **Research and development as an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. Quarterly report, September—November 1977.** Cronauer, D.C.; Lopez, J.; Wynne, F.E. (Gulf Research and Development Co., Pittsburgh, Pa. (USA)). Jan 1978. Contract EX-76-C-01-1800. 58p. Dep. NTIS, PC A04/MF A01.

The overall objective of this project is to perform the research and development work necessary for the creation of an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. This is to be accomplished by developing a pyrolytic coking process for the delayed coking of various coal/petroleum resid slurries to a coker distillate for Fluid Catalytic Cracking to a high octane gasoline blending feedstock. The coke produced should be suitable for use as a power plant fuel, neat, or when blended. This coke should also be suitable for gasification to hydrogen to meet refinery hydrogen requirements. The use of coal in this mode will divert petroleum resid to Fluid Catalytic Crackers for enhanced production of gasoline and fuel. The final exploratory coking runs were continuously charged through a preheater to a one-gallon autoclave at 35 psig. The runs made with Kentucky No. 9 bituminous coal: West Texas resid slurries showed that rapid heating during continuous charging restored the 2.0 weight percent synergistic reduction in coke yield that was lost by slow heating during the incrementally charged runs. Synergism was not retained in runs made with pre-dried Big Horn sub-bituminous coal due either to

predrying and/or pre-oxidizing the coal. Final results of laboratory coking experiments done with tagged samples indicate that no C—C transfer occurs during coking and no hydroaromatics are retained in the coke or heavy asphaltene fraction. A high level of hydrogen transfer occurs during coking and appears to be general H—H scrambling, possibly promoted by the metal reactor or coal mineral matter functioning as a catalyst.

44061 (FE—2245-16) **Research on cross-flow filtration for solids removal from coal syncrudes. Final report.** Harland, J.R.; McNulty, K.J.; Tompkins, F.C. (Abcor, Inc., Wilmington, Mass. (USA). Walden Div.). Feb 1978. Contract EX-76-C-01-2245. 132p. Dep. NTIS, PC A07/MF A01.

Tests were conducted to evaluate the applicability of cross-flow filtration for the removal of solids from solvent refined coal (SRC) filter feed. Preliminary tests were also conducted to evaluate cross-flow filtration for the removal of residual solids from solvent de-ashing overflow. A test system was designed and assembled for evaluating cross-flow filtration elements (sintered stainless steel tubes) at velocities of 10-24 ft/sec, filtration pressures of 5-60 psi, and temperatures of 400-500°F. The performance characteristics of the elements were determined by measuring the solids separation efficiency and the filtrate flux as a function of time and operating conditions. Tests with the SRC filter feed (5W percent ash) indicated that cross-flow filters can provide excellent solids removal (less than 0.05W percent ash in the filtrate), but the flux levels for all of the elements evaluated were too low [(0.28 gfh (2.6 lb/h.ft^2)] and declined too rapidly to make cross-flow filtration an economically viable process. Various techniques were evaluated for restoring the flux but were only partially effective. The preliminary tests with solvent de-ashing over-flow (0.25W percent ash) demonstrated that cross-flow filtration can produce a high quality filtrate (less than 0.05W percent ash) at flux levels substantially greater than those measured for the SRC filter feed.

44062 (FE—2270-24) **Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April—June 1977.** Lewis, H.E.; Weber, W.H.; Usnick, G.B.; Hollenack, W.R.; Hooks, H.W. (Catalytic, Inc., Wilsonville, Ala. (USA)). Dec 1977. Contract EX-76-C-01-2270. 179p. Dep. NTIS, PC A09/MF A01.

Coals from Consolidation Coal Company's Emery mine in Utah and Old Ben's No. 1 mine in Indiana were processed at the Wilsonville, Alabama Solvent Refined Coal (SRC) Pilot Plant. Some effects of solvent quality on coal conversion (in terms of the low-boiling, or "wash solvent" fraction) were noted. Due to its low vitrinite content, Emery coal produced the lowest percentage conversion, lowest solvent yield, and lowest filter cake resistance of any coal heretofore processed at Wilsonville. The use of low cost, asbestos-free precoat material was considered. Results of testing alternate methods for mineral residue separation are discussed.

44063 (FE—2270-29) **Solvent refined coal (SRC) process. Operation of solvent refined coal pilot plant at Wilsonville, Alabama. Monthly technical progress report, March 1978.** Lewis, H.E.; Usnick, G.B.; Weber, W.H.; Hollenack, W.R.; Hooks, H.W. (Catalytic, Inc., Wilsonville, Ala. (USA)). Apr 1978. Contract EX-76-C-01-2270. 22p. Dep. NTIS, PC A02/MF A01.

This report covers operations of the Wilsonville SRC pilot plant for the month of March 1978. A material balance was completed with minimum solids in the dissolver. A run to study hydrogen partial pressure in the reaction section was in progress at the end of the month. The programs to evaluate alternative filter precoat materials and antisolvent additives to centrifuge feed were continued.

44064 (FE—2306-12) **Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976—April 1977 and quarterly technical progress report No. 4, February 1977—April 1977.** Schneider, A.; Hollstein, E.J.; Janoski, E.J.; Talbot, A.F. (Suntech, Inc., Marcus Hook, Pa. (USA). Research and Engineering Div.). May 1977. Contract EF-76-C-01-2306. 37p. Dep. NTIS, PC A03/MF A01.

We conclude from our present work that: (1) 400°C is too low a temperature for practical coal-liquid hydrogenation—425° to 450°C may be needed. (2) Ease of removal of undesirable coal elements at 400°C follows the order: sulfur much greater than oxygen greater than nitrogen. (3) Hydrogen chloride treatment effectively removes basic nitrogen but the wash steps introduce problems with emulsification and small density differences. Modification of the treatment process is slated to correct these problems. (4) Modification of our catalyst by impregnation with lithium and lithium-cerium produced a rate of hydrogenation of coal liquids about equivalent to that experienced with our standard Co-Mo catalyst. (5) Under conditions of high hydrogen partial pressure, the Filtrol HPC-5 catalyst appears to be slightly more active than our standard 1 percent CoO to 2 percent MoO_3 on bauxite catalyst. (6) Design of the bench-scale continuous unit has been delayed but is underway. Further laboratory work is necessary before the design can be finalized.

44065 (FE—2315-19) **Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July—September 1977.** Sullivan, R.F.; Rudy, C.E.; Green, D.C.; Chen, H.C. (Chevron Research Co., Richmond, Calif. (USA)). Oct 1977. Contract EX-76-C-01-2315. 82p. Dep. NTIS, PC A05/MF A01.

The objective of this program is to determine the feasibility and estimate the economics of hydropreocessing four synthetic fuels to distillate fuels, including high octane gasoline, using presently available technology. The feedstocks include shale oil and three coal-derived synthetic crudes. The first feedstock is Paraho crude shale oil, produced in the indirectly heated mode. Pilot plant studies of hydrofining of whole shale oil with ICR 106 catalyst have been completed. The product resembles the fraction of a waxy petroleum crude boiling below 1000°F. There is no 1100°F+ residuum. A 3500-hour pilot plant run showed that the catalyst fouling rate is low and demonstrated that a commercial length run is feasible. However, a guard bed is necessary ahead of the catalyst bed to remove arsenic and iron which can cause plugging. Hydrofined shale oil is an excellent feed for a catalytic cracker. Pilot plant studies show that the 650°F+ fraction of hydrofined shale oil is very similar to hydrofined Middle Eastern vacuum gas oils in its performance in a catalytic cracker. Process design studies based on pilot plant results indicate that it is desirable to hydrofine the whole shale oil to a nitrogen content of about 500 ppM and then to fractionate the product before conventional downstream processing to produce transportation fuels. An alternate scheme for shale oil processing is the coking of the shale oil followed by hydrofinishing of the coker distillate. Preliminary results appear promising. The second feedstock is solvent refined coal. Studies of the hydrofining of a 50/50 blend of SRC and creosote were continued. A run of 1100 hours was achieved with ICR 106 catalyst without the plugging problem that had plagued an earlier test. The catalyst deactivated at a relatively rapid rate.

44066 (FE—2321-31) **Catalyst development program for hydrodesulfurization and liquefaction of coal to produce clean boiler fuels. Monthly report, April 1978.** Berry, D.A.; Hillenbrand, L.J.; Grotta, H.M.; Alcorn, W.R.; Elliott, G.E. (Battelle Columbus Labs., Ohio (USA)). May 1978. Contract EX-76-C-01-2321. 28p. Dep. NTIS, MF A01.

Portions of document are illegible.

Seven rapid screening runs were completed which brings the total for the program to 97. Most of the data are available for the series of seven spherical catalysts tested. The range of results was not wide in spite of significant differences in support characteristics of the catalysts. As in the case of extrudates, NiMo samples outperformed CoMo. Neither type gave results equal to the high density extruded catalysts, HT-500 and HT-400. A series of six used catalysts, selected from the rapid screening runs, has been examined for comparison of the effect of autoclave trials with that found for the continuous flow reactor.

44067 (FE—2353-17) **EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1—May 31, 1977.** Fant, B.T. (Champion-Edison, Inc., Edison, N.J. (USA)). Aug 1977. Contract EX-76-C-01-2353. 41p. Dep. NTIS, PC A03/MF A01.

The process variable study with North Dakota lignite in the 50 lb/day Recycle Coal Liquefaction Unit was completed; variables investigated were temperature and residence time. A sixteen day, continuous, integrated run was completed on the one ton-per-day Coal Liquefaction Pilot Plant with Wyoming subbituminous coal. Treatment of Wyoming coal with Na_2SO_4 prior to liquefaction improves the fluidity and gasification reactivity of liquefaction bottoms. However, the equilibria for Na_2SO_4 pretreatment is not as favored as for H_2SO_4 pretreatment. Hydrofined 350-650°F EDS coal liquids performed like petroleum middle distillate fuel oils in home heating oil burner operability tests. Preliminary results with the base-case price structure indicate incentives to operate liquefaction at more severe conditions than were used in the EDS Study Design. Evaluations will continue. PAM bottoms processing studies have shown that partial oxidation of bottoms for hydrogen production is an economically attractive alternative to steam reforming of high Btu gases when used in combination with FLEXICOKING for fuel gas production. Replacing the steam reformer with the partial oxidation unit is desirable because it makes hydrogen from low-priced bottoms and allows byproduct gas sales. Sensitivity cases are planned to determine the minimum gas price below which partial oxidation is not favored over steam reforming. Initial tests on withdrawing 8-10 mesh dense alumina particles from the operating coal liquefaction reactor cold model were successful. Design of an ECLP solids withdrawal system is proceeding based on this test program.

44068 (FE—2727-1) **Mass transport characteristics of zeolite cracking catalysts. Quarterly report, September 30—December 31, 1977.** Haynes, H.W. Jr. (Mississippi Univ., University (USA). Dept. of Chemical Engineering). 9 Jan 1978. Contract EF-77-S-01-2727. 20p. Dep. NTIS, PC A03/MF A01.

An apparatus for measuring intracrystalline diffusivities of low molecular weight gas phase components in zeolites was constructed by Sarma and is described in references. Major modifications to this apparatus have been undertaken in order to make possible the determination of zeolite diffusivities of condensable vapors. A flow diagram of the modified apparatus is presented. A carrier gas (helium for most applications) passes continuously, and at a steady rate, over the column containing pills of zeolite catalyst. A second helium stream passes through a saturator where a small quantity of hydrocarbon is introduced, and the stream is directed to the loop of a six-port sampling valve. Turning this valve introduces the hydrocarbon pulse into the carrier stream. Samples of the inlet and outlet streams are monitored continuously by rapid response thermal conductivity detectors. Not shown on the diagram is the optional use of a length of dispersion tubing to dampen disturbances sometimes observed when switching the sample valve while operating at high carrier gas velocities. The dispersion tube also serves to broaden the input pulse as one means of eliminating problems with recorder response. The system pressure is set by a back-pressure regulator at the column exit. The column flowrate is adjusted with a needle valve. The design of the apparatus is complete with the exception of the data handling equipment. All components of the apparatus are either on order or have been received. The oven shell is complete and a stand for holding the various components has been constructed.

44069 (TID—28163) **Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7—July 31, 1976.** Schneider, A.; Hollstein, E.J. (Suntech, Inc., Marcus Hook, Pa. (USA). Research and Engineering Div.). 12 Aug 1976. Contract EF-76-C-01-2306. 38p. Dep. NTIS, PC A03/MF A01.

Includes Appendix A, B, C, and D.

The objective of this program is to process coal to coal liquids in such a condition that they can be converted to high-octane gasoline and distillate motor fuels in conventional petroleum refining processes and equipment, the entire operation being economically and technically viable; and to perform an engineering assessment of the process and its economic potential in a process development unit employing a practical reactor design and catalyst system at a scale not exceeding 5-gallons of coal liquids per hour under steady state conditions. Specifically, the course of action will be to apply very deep hydrogenation during the dissolution of coal and/or to solvent-refined coal in order to achieve hydrogen/carbon atomic ratios high enough to allow the application of catalytic cracking, hydrocracking, etc., to the total products of deep hydrogenation or to distillate fractions thereof. It is recognized that the necessary, very substantial removals of nitrogen and oxygen compounds probably will not occur during the catalytic hydrogenations, and chemical removal of these non-hydrocarbons will be carried out (for example by precipitation with hydrogen chloride) after the hydrogenation step but prior to the cat cracking or hydrocracking operations. From preliminary runs it is concluded that: Our present temporary 300 ml reactor and experimental technique are sound; solution of Illinois No. 6 coal is hydrogenated anthracene oil sets in rapidly at 300°C and is apparently independent of catalytic hydrogenation, but dependent on hydrogen transfer from the solvent; our base catalyst, 1% CoO—2% MoO_3 on bauxite, is active in the hydrogenation of anthracene oil and in the dissolution of Illinois No. 6 coal in hydrogenated anthracene oil; and catalytic hydrogenation in the presence of dissolved coal apparently occurs at temperatures as low as 360°C.

PYROLYSIS AND CRACKING

REFER ALSO TO CITATION(S) 44208

44070 **Mathematical model for pyrolysis of a solid particle: effects of the heat of reaction.** Fan, L.S.; Fan, L.T.; Walawender, W.P. *Can. J. Chem. Eng.;* **55**: No. 6, 317-325(Jun 1977).

A transient analysis is presented of the effects of heat of reaction on pyrolysis of a solid. The volume reaction model, which takes into account simultaneous heat and mass transfer phenomena, is used for numerical simulation. Numerical solution is by a finite difference method, the method of lines. Two reaction situations, heat-transfer-controlled and self-sustaining, are considered. Effects of heat of reaction on solid conversion, solid concentration, fluid product concentration, temperature distribution and enthalpy are examined.

44071 **Kinetics of the thermal decomposition of coal under nonisothermal conditions.** Gusev, N.Z.; Morev, A.A. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 30-35(1976).

The results are given of a calculation of the yield of volatile matter from the polydisperse mass of Cheremkhnovo coal under various conditions of heating in an ascending flow of gas.

SOLVENT EXTRACTION

44072 (CONF-7710101—11) **Advanced processes for generation of electric power: solvent refining of coal and combined cycle plants.** Reddy, G.N. (Argonne National Lab., Ill. (USA)). 1978. Contract W-31-109-ENG-38. 6p. Dep. NTIS, PC A02/MF A01.

From 5. national conference on energy and the environment; Cincinnati, OH, USA (31 Oct 1977).

An assessment of the status of technology of solvent refined coal (SRC) production and utilization and low Btu gasification/combined cycle power generation (LBG/CCPG) systems was made. The assessment included an analysis of, among other things, the relative potential for commercial application, energy conversion efficiencies and economics. The potential for commercial application of these two technologies was found to depend on certain institutional barriers and solution of a few technological problems. Energy conversion efficiency for SRC production and utilization for generation of electricity was found to be comparable to conventional plants with flue gas desulfurization systems. Energy conversion efficiency for combined cycle plants was found to be higher than that of conventional plants. Cost of electricity generated by plants based on these two technologies was found to be higher at present but in the future it was projected to be comparable.

BY-PRODUCTS

44073 (TID—28423) **ARC-coal acetylene process development program. Quarterly technical progress report No. 1, 9 January—31 March 1978.** (Avco Corp., Wilmington, Mass. (USA). Systems Div.). 10 Apr 1978. Contract EM-78-C-02-4507. 45p. Dep. NTIS, PC A03/MF A01.

The objectives of the Arc-Coal Acetylene Development Program are as follows: To develop a 1 MW (nominal) arc reactor producing a 30% yield of acetylene with SER (kwhr/lb C_2H_2) of approximately 4; to develop components and a subsystem to classify and segregate carbon-black at 99.5% purity from the particulate material in the process stream; and to demonstrate the commercial attractiveness of this process to the petrochemical community with economic analyses and projections. The approach is to design, develop, test and evaluate a 1 MW arc reactor system suitable for an Engineering Test Facility based on scale-up of a previously successful 200 kW arc-coal reactor; to design, develop, test and evaluate a carbon-black segregation system; and to combine the two subsystems in a development test facility designed and constructed by an engineering-construction firm. The contract specifies a requirement for design and construction of an engineering test facility to house the 1 MW arc reactor system, the char and carbon-black separation systems, coal feeding systems, gas product flare and scrubber systems, and the required prime movers and auxiliary equipment.

PROPERTIES

REFER ALSO TO CITATION(S) 44067, 44126, 44130

44074 (COO—4227-4) **Coal anion structure and chemistry of coal alkylation. Fourth quarterly progress report, December 1, 1977—February 28, 1978.** Stock, L.M. (Chicago Univ., Ill. (USA)). 1978. Contract EF-77-S-02-4227. 19p. Dep. NTIS, PC A02/MF A01.

Three research problems are in progress. First, work is progressing well concerning the methods appropriate for the reductive alkylation of Illinois No. 6 coal samples. We have investigated the influence of the leaving group on the conversion of the Illinois coal to a soluble material. We find that the n-butyl iodide is more effective than other n-butyl halides. Second, preliminary results have been obtained concerning the distribution of hydrogen and deuterium atoms in the reaction of Illinois No. 6 coal samples with perdeuteriotetralin at 400°C. Third, the nuclear magnetic resonance spectra of appropriate model compounds with n-butyl groups have been tabulated for comparison with the spectroscopic results obtained from coal alkylation products. Fourth, the chromatographic procedures necessary for the separation of the coal samples are being developed.

44075 **Expression of results of coal analysis: the case for brown coals.** Kiss, L.T.; King, T.N. *Fuel;* **56**: No. 3, 340-341(Jul 1977).

The correct estimation of mineral matter in brown coals is not easy, because most ash-forming inorganics occur directly bound to the coal substance rather than as discrete minerals. It is shown that the ash is not a reliable measure of either the mineral matter or the inorganic matter or both combined. A method of rapid analysis has

been developed using X-ray fluorescence and atomic absorption techniques to determine pyrite and individual elements, giving a reliable estimate of mineral and inorganic content, and thus a better estimate of oxygen content.

44076 Cooling of solid particles with irregularly shaped surfaces. Stephan, K. (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Technische Thermodynamik und Thermische Verfahrenstechnik); Bohnstedt, W. (Hoesch Werke A.G., Dortmund (Germany, F.R.)). *Waerme- Stoffuebertrag.;* **9**: No. 3, 145-149(1976). (In German).

Cooling rates of solid particles with irregularly shaped surfaces are much higher than those of a corresponding particle having the same volume but a smooth surface. For calculating cooling rates a shape factor is defined as the ratio between the thermally effective surface and the surface of a corresponding sphere with the same volume. The shape factor is determined by means of calorimetric experiments. These experiments performed with coke particles proved the shape facts to be constant for the most often met volume Vsub(k) >= 30 cm^3 of coke particles. Cooling rates are quite easily evaluated by means of the shape factor.

44077 Chromatographic investigations of the components of the liquid nonvolatile constituents of the plastic mass of coal. Biryhkov, Yu.V.; Nesterenko, L.L.; Yurina. L.V.; Trofimova, V.G.; D'yachenko, Yu.V. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 111-116(1976).

The results are given of an investigation of the quinoline-soluble fraction of the liquid nonvolatile components of the plastic mass of coals of different ranks by the methods of thin-layer chromatography, gel chromatography, and fractional precipitation. The nature of the change in the chemical composition and the molecular-weight distribution of these products according to the rank of the coals from which they were isolated has been shown.

44078 Adsorption of vapors of organic substances on coal. Bulashev, V.M.; Popov, V.K.; Kogan, L.A.; Ol'shanetskii, L.G. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 63-67(1976).

The adsorption isotherms of n-hexane, n-heptane, n-octane, cyclohexane, and benzene, on gas coal have been determined; they show the activated nature of the adsorption. A method is proposed for calculating the kinetic coefficient of penetration of the adsorbed molecules into the micropores, and the activation energies of the process have been calculated. The heat of adsorption has been determined from the dependence of the retention time on the reciprocal temperature.

44079 Question of the accuracy of the determination of the microhardness of anthracites. Posylnyi, V.Ya.; Trostnikov, A.A. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 153-155(1976).

Paper considers the possibility of increasing the accuracy of measuring the microhardness of anthracite.

44080 Petrographic characteristics and technological properties of coals of the Krasnoarmeiskii region of the Donbass. Eremin, I.V.; Bronovets, T.M.; Musyal, S.A.; Limonova, V.Ya.; Slepets, T.F. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 68-73(1976).

The petrographic characteristics and chemical and technological properties of coals of the Krasnoarmeiskii region of the Donbass have been studied in detail. On the basis of the petrographic parameters, the classification of coals from four pits has been refined.

44081 Reduction in the error of determining the ash content of coal by the radioisotope method. Bochenin, V.I. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 145-147(1976).

A new radioisotope device with two sources, Fe-55 and Cd-109 for accelerating the checking of the ash impurities in run-of-mine coal is proposed. The percentages of ferric oxide and calcium oxide are determined by recording the fluorescent radiation, and aluminium oxide and silicon dioxide are determined from the scattered gamma radiation.

44082 Measurement of the reflectance of vitrinities in partially polarized light. Dobronravov, V.F. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 50-58(1976).

A theoretical analysis of the variability of the reflectance of vitrinites, taking into account the degree of polarization of the light incident upon a polished section, has been performed. It has been established that the expected value of the reflectance, in measurements on ground sections of briquettes on randomly-oriented grains, does not depend on the degree of polarization of the light and is equal to the mean volume reflectance of the vitrinite. Three components of the total variance of the reflectance of vitrinite in the polished section of a briquette have been determined mathematically; the variance due to the anisotropy of the vitrinites; the variance of the volume reflectance which characterizes the physicochemical nonuniformity of the vitrinites; and the variance connected with the technical errors of the measurements. A method has been developed for determining the degree of polarization of light incident upon a polished section in a microscope with a photoelectron attachment. Methods are given for determining the volume reflectance of vitrinites.

44083 Comparison of the classification of coals used in individual countries with the International Classification. Eremin, I.V. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 6-11(1976).

Different limiting values of the classification parameters are used in existing classification systems. The International Classification parameters are dependent on the rank and petrographic composition of the coal. Examples are given of the actual use of the petrographic characteristics to evaluate the quality of coals and to check the uniformity of coal supplies and the composition of coal charges. A draft Unified Classification of coals based on genetic parameters is proposed.

44084 Study of the physicochemical properties of activated coke. Nefedov, Yu.A.; Sokolovskaya, I.B.; Khitrik, S.I.; Ermolenko, T.E. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 123-126(1976).

The influence of additions of alkali metals and ferric chloride in increasing chemical activity of cokes from gas coals is considered. It has been shown by mercury porosimetry and wetting contact-angle measurements that the additions introduced into a coal charge increase the porosity of the cokes and improve their wetting by the slag, which is important for intensifying the carbon thermal processes of reduction from melts. The catalytic action of the additives is explained by the insertion of the metal atoms or ions present in the additives into the structure of the coke, thanks to which acts of adsorption and crystal-chemistry interactions are facilitated.

WASTE MANAGEMENT

REFER ALSO TO CITATION(S) 44028, 44965, 45364

44085 (COO—4502-2) Preliminary evaluation of the biological oxidation of thiocyanates. Progress report, November 30, 1977—February 28, 1978. Neufeld, R.D.; Valiknac, T. (Pittsburgh Univ., Pa. (USA). Dept. of Civil Engineering). Mar 1978. Contract EY-77-S-02-4502. 24p. Dep. NTIS, PC A02/MF A01.

Acclimated biological cultures were developed from activated sludge taken from coke plant biological waste treatment facilities. These cultures are capable of degrading potassium thiocyanate from an original concentration of 2000 mg/l SCN to less than 1 mg/l in an aeration period of 9 hours. pH inhibition appears to be significant at values greater than 7.6. Substrate inhibition occurs at concentrations of thiocyanate greater than 500 mg/l. Air stripping of thiocyanate does not appear to occur at neutral pH value. Preliminary assessments indicate that aerobic biological organisms may play a major role in the removal of aqueous thiocyanate as found in the wastewaters from the gasification of certain coals.

44086 (NTIS/PS—78/0052) Coal mine waste (a bibliography with abstracts). Report for 1964—January 1978. Smith, M.F. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 143p.

Research topics cover coal mining refuse, refuse dumps and spoil. Studies on disposal, utilization, environmental impacts and testing of these wastes are included, as are reports on land reclamation and spoil bank safety. (This updated bibliography contains 138 abstracts, 39 of which are new entries to the previous edition.)

44087 Coal and coal mine drainage. Boyer, J.F.; Gleason, V.E. *J. Water Pollut. Control Fed.;* **49**: No. 6, 1163-1172(Jun 1977).

The formation of acid mine drainage its treatment and control, surface mining and its environmental effects, and coal preparation wastes are considered. The bibliography contains references to 76 American papers published during 1976.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 44037, 44127

44088 (ANL/AA—6(Vol.2)(DRAFT)) Assessment of the health and environmental effects of power generation in the Midwest. Volume II. Ecological effects. Dvorak, A.J.; Pentecost, E.D. (Argonne National Lab., Ill. (USA)). Apr 1977. Contract W-31-109-ENG-38. 181p. Dep. NTIS, PC A09/MF A01.

This report presents an initial evaluation of the major health and environmental issues associated with increased coal use in the six Midwestern states of Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. Using an integrated assessment approach, the evaluation proceeds from a base-line scenario of energy demand and facility siting for the period 1975 to 2020. Emphasis is placed on impacts from coal extraction, land reclamation, coal combustion for electrical generation, and coal gasification. The range of potential

impacts and constraints is illustrated by a second scenario that represents an expected upper limit for coal utilization in Illinois. Volume I of the report includes a characterization of the energy demand and siting scenarios, coal related technologies, and coal resources, and the related impacts on air quality, water quality, and human health. Volume II includes background information on the native ecosystems, climate, soils, and agricultural land use and a description of the ecological impacts expected from coal utilization in southern Illinois, which as ecosystems representative of a large segment of the six-state area.

44089 (CONF-780213—11) **Health and environmental impacts of fluidized-bed combustion of coal.** Hoover, L.J. (Argonne National Lab., Ill. (USA)). 1978. Contract W-31-109-ENG-38. 23p. Dep. NTIS, PC A02/MF A01.

From 107. AIME meeting; Denver, CO, USA (26 Feb 1978).

The findings of the study regarding major areas of impact are summarized on a comparative basis. The results depend on many assumptions. They are also dependent on current engineering designs and proposed methods for handling and treating wastes. These aspects could change as the technology for the FBC is developed and are dependent on costs and on the competitive position of the technology. The relative competitive positions among the technologies are unknown, as all of the options appear capable of meeting federal standards; acceptance by utility customers may well center on plant items that do not influence impacts on health and the environment. The impacts are summarized under the headings of health, environment, society (limited sense), resource use, and dollar cost. There is no meaningful, simple way to combine these impacts into a single value or ranking. An overview statement that perhaps sums up the assessment is that the AFBC technology has acceptable impacts in that it has some advantages and disadvantages compared with conventional technologies; the thrust for its development is not based on a large reduction in environmental and health impacts, but possible improvements in utility plant operation and attendant dollar costs.

44090 (PB—273847) **Electric power and synthetic fuels industries in the southwest: production and environmental control technologies.** Harrington, W.; Abbey, D.; Sawyer, J.W. Jr. (Resources for the Future, Inc., Washington, D.C. (USA)). Aug 1977. 229p. NTIS PC A11/MF A01.

This report is concerned with the technologies most likely to be employed in the development of the vast coal and oil shale resources that underlie the arid and mountainous lands of the American Southwest. These technologies--electric power production, gasification and liquefaction of coal, and liquid fuels production from oil shale--evoke a concern with the potential environmental impacts, particularly those relating to water consumption and the discharge of residuals, and with the extent to which these impacts can be mitigated by the application of control technology. This document focuses on: (1) the chemistry, reserves, and production of coal; (2) technologies for fossil fuels--electric power production, energy transportation, synthetic gas, syncrude from coal, and the oil shale industry; (3) control technologies; (4) cooling system functions; and (5) the changing energy picture in the Southwest.

44091 **Preparation, construction, and operation of a plant for recharging groundwater in the Halle Region.** Jakob, W. *Neue Bergbautech.*; 7: No. 2, 86-89(Feb 1977).

An account is given of the planning construction and operation of a percolating trench. This method was used to counteract the lowering of the groundwater level caused by lignite mining.

RESERVES AND EXPLORATION

44092 (EMD—78-23) **Summary of problems associated with coal reserve estimates.** Staats, E.B. (General Accounting Office, Washington, D.C. (USA)). 11 Jan 1978. 18p. General Accounting Office, Washington, DC.

We (GAO) believe that there are fundamental and serious shortcomings in the accuracy and reliability of coal reserve estimates prepared and disseminated by the US Department of the Interior. Current available data on reserves is extremely spotty and outdated. Even the information available from both Interior and leaseholders on coal reserves under Federal lease cannot be considered accurate. Accurate coal reserve data is needed to permit sound public policy decisions on what kind of coal to mine and where and when. Accurate and reliable coal reserve data is also needed to enable Interior to effectively manage the Federal Coal Leasing Program. GAO has been a strong advocate over the past several years for the improvement of coal reserve data. In several previously issued reports, we made specific recommendations for actions to improve coal reserve estimates. We recognize that the Departments of Energy and Interior have been working together during the past few months. However, we continue to believe that further action is needed on these recommendations to insure that public policy decisions are made on the basis of accurate, reliable data. The establishment of the Energy Information Administration within the Department of Energy has given that Department responsibilities in the area of energy data collection and analysis. Therefore, our recommendations require action by both DOE and Interior.

MINING

REFER ALSO TO CITATION(S) 44140, 44141, 44142

44093 (ANL/AA—11(Vol.1)(Draft)) **National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints.** (Argonne National Lab., Ill. (USA)). Oct 1977. Contract W-31-109-ENG-38. 107p. Dep. NTIS, PC A06/MF A01.

The objectives of the National Coal Utilization Assessment (NCUA) are to: (1) provide the Department of Energy (DOE) with the impact and impact-management information needed to ensure that environmental and social concerns receive appropriate emphasis in DOE coal R and D programs; (2) identify and analyze strategies to alleviate potential problems or constraints associated with increased coal use; and (3) work closely with state and regional agencies and DOE to present the NCUA findings in a useful manner. This report documents Argonne's examination of: Technology characteristics; Energy supply and demand trends; Siting constraints on coal-related facilities; Impacts of increased coal use on water availability, land use, and coal reserves; Impacts on air and water quality and ecosystem; effects of trace-element emissions from coal combustion/conversion; Social and economic impacts; and Health risks. The assessment, which covered 14 northern midwestern states, placed significant emphasis on identifying the coal-related problems and risks that are of particular concern to state and regional agencies and commissions.

44094 (FE—SFMP-1(78)) **Chainless haulage systems for power loaders. Information circular as of April 1978.** Fennelly, S.D. (Department of Energy, Washington, D.C. (USA). Div. of Solid Fuels Mining and Preparation; National Coal Board, Burton-on-Trent (UK). Mining Research and Development Establishment). May 1978. 50p. Dep. NTIS, PC A03/MF A01.

This report presents an overview of the use of chainless haulage systems for longwall power loaders in the United Kingdom. Currently available, as well as planned systems, are listed and described. Current and forecasted uses of such systems are presented.

44095 (N—77-33479) **Underground coal mine instrumentation and test. Final report.** Burchill, R.F.; Waldron, W.D. (Shaker Research Corp., Ballston Lake, N.Y. (USA)). 1976. Contract NAS8-31668. 129p. (NASA-CR—150045). NTIS PC A07/MF A01.

The need to evaluate mechanical performance of mine tools and to obtain test performance data from candidate systems dictate that an engineering data recording system be built. Because of the wide range of test parameters which would be evaluated, a general purpose data gathering system was designed and assembled to permit maximum versatility. A primary objective of this program was to provide a specific operating evaluation of a longwall mining machine vibration response under normal operating conditions. A number of mines were visited and a candidate for test evaluation was selected, based upon management cooperation, machine suitability, and mine conditions. Actual mine testing took place in a West Virginia mine.

44096 (PB—274324) **Evaluation of the use of air curtains to increase face ventilation. Final report, April 1975—March 1977.** Krisko, W.J. (Donaldson Co., Inc., Minneapolis, Minn. (USA). Protective Systems Dept.). Jun 1977. Contract H0357097. 126p. NTIS PC A07/MF A01.

Laboratory and in-mine tests were used to determine the feasibility of using an air curtain in place of brattice cloth to separate incoming air from exhaust air at the face of a room-and-pillar underground coal mining operation. Laboratory experiments proved that the concept of an air curtain separating two parallel streams of air is valid. The in-mine tests consisted of measuring respirable dust concentrations at the operator's position both with and without the air curtain. These tests demonstrated that the installed air curtain could act as effectively or more effectively than line brattice in coursing air to the working face.

44097 (PB—274345) **Deep cutting continuous miner. (effect of drum rotational speed and depth of cut on airborne respirable dust and specific energy). Final report, January 1972—December 1976.** Black, S.; Rounds, J. (Ingersoll-Rand Research, Inc., Princeton, N.J. (USA)). Jun 1977. Contract H0122039. 288p. NTIS PC A13/MF A01.

A special deep cutting continuous miner was built to study the effects of rotational speed and depth of cut on airborne respirable dust. After preliminary tests indicated and later verified that deep cutting - low rotational speed reduces airborne respirable dust, a series of underground tests were performed (9 combinations of rotational speed and depth of cut at 45 degrees bit angle and 4 inch bit spacing). Additional data was obtained on specific energy, coal sizing and noise. The conclusions reached from the tests results were: (a) deep cutting reduces airborne respirable dust generated and specific energy needed to cut coal, (b) the greater majority of the decrease occurs in going from 1 inch to 2 inch depth of cut, (c) lowering rotational speed has a particularly sizable effect of reducing the amount of dust at the operator's location, (d) no significant relationship was found for either noise level or coal sizing to rotational speed or depth of cut. Recommendations include: (a) use of specific energy as an indicator of the change in dust level correlating to changes in cutting parameters, (b) mine operators should acquire new deep cutting machines, since retrofitting would be selective.

44098 (PB—274373) **Technical and economic feasibility of surface mining coal deposits, North Slope of Alaska. Final report.** (Kaiser Engineers, Oakland, Calif. (USA)). Aug 1977. Contract J0265051. 161p. NTIS PC A08/MF A01.

This report on the feasibility of surface mining on the North Slope of Alaska has considered the quantity and quality of the North Slope deposits with attention paid to the economic, technical, and environmental constraints of the mining systems suggested for the three candidate minesites at Kukpowruk River, Elusive Creek, and Kuk River.

44099 (PB—274402) **Design of a quiet rock drill. A feasibility study using principles of leavell pavement breaker. Final report.** Anderson, F.R.; Shaikh, N. (Vast Research Co., Bella Vista, Ark. (USA)). Jun 1977. Contract J0166122. 41p. NTIS PC A03/MF A01.

Noise control of existing pneumatic drills is difficult and runs into cost, performance, and weight penalties. A need exists for a start-from-scratch approach for quiet pneumatic rock drills. The designs based on Leavell principles, that has been successfully used in demonstrating a quiet and vibration-free paving breaker, is the concept chosen here. This report shows the feasibility of a quiet stoper for drilling roof bolt holes in coal mines. The work is directly applicable to pneumatic percussive rock drills. The report shows an oscillator based on patented Leavell concepts which results in a vibration-free tool and noiseless exhaust. Dynamics of the oscillator is analyzed. Independant rotation of drill rod is provided by an air motor (screw expander) and flushing of cuttings is accomplished by an air ejector in a compact lower housing. The feasibility of no exhaust noise, low drill machine noise, and vibration-free casing is discussed.

44100 (PB—274683) **Evaluation of experimental and developmental communication systems used in underground coal mines. Performance of trapped-miner communication system. Final report, 1 April 1976—31 January 1977.** Michael, P.L.; Prout, J.H. (Pennsylvania State Univ., University Park (USA). Environmental Acoustics Lab.). Feb 1977. 87p. NTIS PC A05/MF A01.

Several evaluations were made by modified rhyme test (MRT) word lists transmitted through various simulations of the trapped-miner system being developed by the Federal Bureau of Mines. The tests were performed in a 'single blind' situation so that the evaluators would not be biased by knowing the characteristics of the system being simulated. A computer program was developed to provide a simulation of the electrical aspects of the communication system and to provide an evaluation by calculation of the articulation index (AI). The study indicates that communication through the presently proposed system will be somewhat unreliable at depths as great as 300 meters even with the system operating at maximum efficiency.

44101 Coordination of strip mining and completion of longwall working. Beckmann, K. *Bergbau;* **28**: No. 10, 398-406(Oct 1977). (In German).

A long wall mining system requires the cor-ordination of extraction and transport equipment with mining and with the return and control equipment. Coal planing equipment is introduced as part of a long wall system which has undergone many changes in the cource of 35 years' development and which has reached a very high state of development with the help of scientific investigation and based on practical experience in use. Detailed investigations gave suitable tool parameters for cutting coal. The method of construction and of operation and control of coal planing equipment, particularly of the hook plane and sliding plane, are described. An evaluation of shield types of mining is also given.

44102 Electrical equipment for roller conveyors. Weber, K.H.; Czauderna, N. *Bergbau;* **28**: No. 10, 380-389(Oct 1977). (In German).

Electrical technology has an important part to play in the development of high performance roller conveyors and the associated mechanisation and automation of mining operations. The report describes the electrical equipment of roller conveyors, which provides the drive and also makes control, regulation and monitoring of mining operations possible either locally or from the face control room. Experience is described on working with trailing cables for the power supply of the roller conveyor. Further, the report describes a programmed trailing roller conveyor.

44103 Pump-packing systems at Florence Colliery. Hodgkinson, D.R. *Min. Eng. (London);* **136**: No. 195, 707-716(Aug 1977).

The paper describes the development of pump packing and in particular the two systems adopted at Florence Colliery. Cockshead 9's is an advancing face in a seam liable to spontaneous combustion and where the main and return gates are pump packed. Rowhurst 4's is a retreat face in which the main gate only is pump packed in order to retain a sufficient section, so that it can be used again as a return for the future adjacent panel.

44104 Working the Threequarter seam at Markham colliery, with particular reference to the conveyor-mounted trepanner. Otter, K.J.; Nash, T.J. *Min. Eng. (London);* **136**: No. 195, 697-705(Aug 1977).

This paper examines the methods of working the Threequarter seam and shows how the systems have been developed to effectively deal with roadway drivage in the hard strata associated with the Threequarter seam. It indicates that the DECMT is the most efficient power loader in this seam but it is not without problems, the most serious being the ignition hazard. The second part of this paper discusses in detail the modifications made to the machine and the methods employed to ventilate the hazardous zone around the floor discs to minimize this hazard. The paper concludes by outlining developments in machine methane monitoring.

44105 Designing for bulk output from thin seams using the AS buttock shearer. Collier, L. *Min. Eng. (London);* **136**: No. 195, 671-680(Aug 1977).

The need for consistent high productivity from thin faces is evident as the number of mechanized faces of this type increases. This paper examines the performance of South Leicester Colliery and the reasons for planning a face of one metre in height to produce 500 tonnes per shift. The changes made in the system to meet objectives once production commenced are described. The particular features which are of importance are the introduction of a Buttock Shearer, steam as a dust suppressant, low pressure jet stowing, and the use of a liquid nitrogen power pack during installation work.

44106 Efficiency of coalface equipment. Berry, J.P. *Min. Eng. (London);* **136**: No. 195, 681-690(Aug 1977).

Following the national dispute in early 1972, the wastage of face-trained manpower from North Notts Area highlighted the need to reduce the numbers of men in face teams in order to maintain the optimum machine-shifts per day. This manpower economy is described. Higher voltages applied to coalface equipment, the introduction of heavier powered supports and design improvements on other equipment achieved more reliability of face installations. The concept of colliery strategic plans is not new in the area and refinements over the years are paying dividends in the reduction of high risk areas of coal, less roadway repairs and more efficient face operations.

44107 Roller cutting machine. Funke, W.; Honke, H.; Lanfermann, W. (to Gebrueder Eickhoff Maschinenfabrik und Eisengiesserei m.b.H., Bochum (Germany, F.R.)). German(FRG) Patent 2,558,850/A/. 7 Jul 1977. 7p. (In German).

The invention is an addition to patent registration P25 52 085.8, which describes a cutting machine which is designed for mining minerals (mainly bituminous coal) and which is connected with long-wall mining. The purpose of the additional claim is the unloading of the gearing of the driving wheel by the machine itself, which occurs above all when driving through saddles. This should occur through a supporting roller, which rolls on the running track and is arranged at such a height that the teeth of the driving wheel of the machine and the pinion at the long-wall mining track have the optimum depth of engagement. Lifting out of the gearwheel when driving through depressions is prevented by a part which grips below the pinion and keeps the gearwheel in engagement.

44108 Up and AteM: Bentley Colliery. Watson, T. *Colliery Guardian;* **225**: No. 7, 357-358(Jul 1977).

This article on advanced technology mining includes a brief history of Bentley Colliery and a description of D33s face.

44109 Longwall mining. Glasby, H. *Colliery Guardian;* **225**: No. 7 (Suppl.), 1-24(Jul 1977).

Report on Anderson Strathclyde Ltd. includes details of their longwall mining, roadway drivage, electrical and electronic, and conveyor equipment.

44110 Lightweight and cheap depth sampler. Frost, R.C. *J. Hydrol.;* **33**: No. 1/2, 173-178(Mar 1977).

A need for water samples from considerable depths in flooded collieries was met by a specially designed light-weight and cheap sampling system which proved entirely satisfactory in operation. Field tests have shown the efficiency of the design. Repeat samples could be obtained without difficulty and many depth profiles of water composition have been obtained. Tests with commercially available depth samplers have shown that the specially designed system is more convenient and accurate in operation.

44111 Use of pneumatics by Houilleres de Provence. Monier, G. *Ind. Miner., Mine;* 34-35(Mar 1977). (In French).

In 1972, Houilleres de Provence chose to transport men and materials on diesel engines with tires. This resulted in frequent blockages and destruction of tires. A search for a solution resulted in a puncture proof inner tube which is composed of a rubber torus containing independent interslices pressurized with nitrogen at the time of manufacture. Many interslices can be punctured before the pressure becomes too low. Such a tube can last through three tires the average lifetime of which is increased from 800 to 1200 h. The cost per hour of the new tire is slightly less than that for conventional tires.

44112 Optimal choice and conditions for the use of tires in mines, quarries, public works, and civil engineering. Habourdin, P. *Ind. Miner., Mine;* 16-32(Mar 1977). (In French).

In iron mines where transport on tires has been developed in recent years, the choice of tire is of major importance for safety reasons (fatal accidents due to explosion) and economic reasons (the cost of tires throughout the life of a machine can amount to 80% of the buying price of the machine). The choice of tire is related to: its dimensions, which depend on the load and speed; the casing, its shape and manufacture; and the rim. Examples and estimates are given of the lifetime of a tire. The development of puncture proof tires is discussed. The retreading of tires is examined from technical and economic standpoints.

44113 Predicting water inflow in the Kuzbass pits. Kermerov, A.I.; Raikh, R.A. *Ugol;* **52**: No. 2, 58-60(Feb 1977). (In Russian).

A method of prediction is developed, based on permeability and depth.

44114 Slice working of thick seams as a function of rock pressure. Grapanovich, L.N. *Ugol;* **52**: No. 2, 9-14(Feb 1977). (In Russian).

A method of thick seam working is described in which the coal is removed by inclined slices and the waste caved. Measurements have been made of changes in strata pressure in relation to face length and progress of winning. This method of working is not suitable for seams inclined at angles greater than 35 deg. or more than 350m deep.

44115 Seam extraction conditions in the Western Donbass classified according to the hydrogeological factors. Bezaz'yan, A.V.; Yakovlev, E.A. *Ugol;* **52**: No. 2, 54-58(Feb 1977). (In Russian).

This paper presents a classification system dependent upon permeability and access to water-bearing strata. They then categorize the pits in this coalfield according to their hydrogeology. A relationship between vitrinite content and permeability is also shown.

44116 Temperature monitoring at the seat of fires using the ethylene—acetylene ratio. Alperovich, V.Ya. *Ugol Ukr.;* **21**: No. 1, 46-47(Jan 1977). (In Russian).

The use of the ethylene-acetylene ratio to measure and predict temperatures in mine fires has been investigated. The method of measurement is outlined and a graph is presented showing the relationship between temperature and the ratio for coals of different ranks.

44117 Energy changes due to mining. Walsh, J.B. *Int. J. Rock Mech. Min. Sci.;* **14**: No. 1, 25-33(Jan 1977).

Convergence resulting from enlarging an excavation decreases the gravitational potential energy. Part of this energy change increases the strain energy of the system. Part does work at the boundaries; this includes work done against friction and dilatancy at cracks, work done to compress the supporting props and work done against lateral lithostatic stresses. The remaining energy is assumed to be radiated by seismic waves and eventually lost as heat. Expressions for these energy changes are derived in terms of the stress changes and the associated displacements in the excavation and on the cracks surrounding it. Analysis shows that the residual energy can be attributed to potential energy changes due to convergence of the cavity, bodily displacement of the cavity, elastic unloading of the rock in this cavity, and displacement of the mined rock in the gravity field. Only the first term is of importance in most underground mining. Slip on cracks tends to increase residual energy by increasing convergence and decrease it through losses due to friction and dilatancy. The relatively low level of seismic energy radiated in deep-mining operations suggests that losses associated with cracks may be a significant factor in the energy balance.

44118 French mining equipment industry. Jeannard, P. *Ind. Miner.;* **59**: No. 1, 33-51(Jan 1977). (In French).

The president of the "Syndicat des Constructeurs de materials pour mines et travaux souterrains" explains the activities of the industry which is composed of about sixty companies. New developments in coal cutting; boring; support; loading; materials handling and transport; and preparation are described. The industry's exports are indicated.

44119 Rod-shaped probe for soaking minerals to be mined, especially coal in mining. Hoffmann, E. (to Schmidt, Kranz und Co. G.m.b.H., Zorge (Germany, F.R.)). German(FRG) Patent 2,514,145/A/. 14 Oct 1976. 9p. (In German).

A fibre-reinforced inflated hose, whose end is made into a nozzle by the pressure of an annular component, can be used for soaking mineral, particularly coal, to be mined. Particular care must be taken that the nozzle is not damaged during operation, and that the reaction effect of the jet is largely counteracted. This is achieved by fixing an impact plate at an axial distance before the opening of the nozzle at the hose. There are transverse outlet openings for the soaking liquid between the impact plate and the front of the hose.

44120 Method and device for cleaning underground cavities, especially in bituminous coal mining. Hoelter, H. German(FRG) Patent 2,508,66/A/. 9 Sep 1976. 11p. (In German).

The increased use of conveyer plant, particularly for coal transport, increases the problem of cleaning underground cavities. The dust suction equipment must have a large storage capacity for relatively small dimensions, and must be able to remove the dust from the plant in compacted form. This is achieved with a device which can be moved suspended on a monorail, by transporting the dust through several dust collection containers using a flow of suction air. The dust is fractionated in this and is deposited relatively evenly. The last containers are equipped with cyclones for increased separation of fine material, in order not to overload the subsequent gauze filter. The dust which is extracted by tilting the dust collection containers using the spirals is compacted by suitable means, for example in a paddle humidifying spiral. The compacted dust is then passed on to other forms of transport.

44121 Use of one-dimensional compression tests and elastic theory in predicting deformations of rockfill embankments. Charles, J.A. *Can. Geotech. J.;* **13**: No. 3, 189-200(Aug 1976).

A laboratory investigation into the deformation behavior of a rockfill material undergoing anisotropic compression at different stress ratios is described. The extent to which elastic parameters derived from one-dimensional compression can predict the behavior of the rockfill at other stress ratios is considered.

TRANSPORT AND HANDLING

REFER ALSO TO CITATION(S) 44029, 44030, 44038

44122 (CONF-7710101—9) **Study of coal preparation and cleaning: summary and results.** Buder, M.K.; Huettenhain, H.; Wong, S.H.; Yu, J. (Argonne National Lab., Ill. (USA)). 1977. Contract W-31-109-ENG-38. 27p. Dep. NTIS, PC A03/MF A01.

From 5. national conference on energy and the environment; Cincinnati, OH, USA (31 Oct 1977).

The effects of coal properties on pulverized coal firing, fluidized bed combustion, and low-Btu gasification for combined cycle power generation were examined. The most significant coal characteristics in power generation include heating value, sulfur content, ash content and mineral composition, and moisture content. Some coal properties are affected when the coal is subjected to coal preparation and cleaning (CPC). The most important improvements are lowered S and ash content, upgraded heating value, greater uniformity of fuel composition, and reduced moisture content. Further benefits include the rejection of erosive and abrasive materials with the refuse, the alleviation of power plant ash disposal requirements, reduced weight/MM Btu for transportation, control of the coal size consist, and removal of some volatile trace elements. Removal of pyritic S can in some cases render the coal environmentally acceptable for direct combustion. Pyritic S removal can also reduce the fouling and corrosion of steam generator surfaces. In fluidized bed combustion there is the prospect of obtaining an economic benefit by the precombustion removal of S from the coal to decrease sorbent usage. Through ash removal, CPC can decrease the amount of slagging and fouling in conventional steam generators. If Na is rejected, the potential of high temperature fouling specifically can be limited. In both conventional steam generators and in gasifier/combined cycle systems, reductions in mineral matter will

effectively lower gas-particulates separation requirements. Where gas turbines are employed, lower blade corrosion rates are possible when CPC rejects Na and K.

44123 (IS-ICP—50) **Comparison of coal beneficiation methods.** Min, S.; Wheelock, T.D. (Iowa State Univ. of Science and Technology, Ames (USA). Energy and Mineral Resources Research Inst.). Sep 1977. 20p. (CONF-770814—13). Dep. NTIS, PC A02/MF A01.

From American Chemical Society meeting; Chicago, IL, USA (29 Aug 1977).

The laboratory application of 16 different treatments involving size reduction and physical separation to high-sulfur coal containing substantial amounts of finely disseminated microcrystals of iron pyrites provided several interesting and important results. Comparison of these results with a standard washability analysis showed that most of the treatments produced a cleaner coal for a given yield than could be obtained by gravity separation alone of 4 cm x 0 size coal. In this regard the treatments which failed to produce coal with a lower sulfur content were generally those which involved only size reduction and oil agglomeration. Treatments involving two and sometimes three methods of separation in sequence proved particularly effective. Thus the pyritic sulfur content of two Iowa coals was reduced 85 to 86% with an overall yield of 82 to 84% by treatment 14 which included chemical comminution, roll crushing, gravity separation, fine grinding, and oil agglomeration. This sulfur reduction was considerably higher than that provided by single-stage separation. Thus a maximum reduction of 66% in the pyritic sulfur content of ICO coal was realized during the froth flotation step of treatments 11—12 and of 64% in the pyritic sulfur content of Jude coal during the gravity separation step of treatments 13—16. Each of the separation methods used in these treatments proved effective in itself. Moreover the methods seemed to complement each other, particularly when used in conjunction with particle size reduction. Chemical comminution generally improved the separation efficiency of the various treatments and fine grinding the separation efficiency of the oil agglomeration method of separation in particular.

44124 (PB—274262) **Inspection manual for the enforcement of new source performance standards: coal preparation plants. Final report.** Shah, Y.M.; Burke, J.R. (PEDCO-Environmental, Inc., Cincinnati, Ohio (USA)). Nov 1977. Contract EPA-68-01-3150. 149p. NTIS PC A07/MF A01.

Standards of Performance for new and modified coal preparation plants were promulgated under Section III of the Clean Air Act on January 15, 1976. This report presents procedures for inspection of coal preparation facilities toward determination of their compliance with NSPS. It also provides background information that will aid the inspector in understanding the coal preparation process and the effects of operating parameters on process emissions.

44125 (PB—274405) **Financing public expenditures for energy-impacted roads.** Harvey, C.E. (Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). Nov 1977. 30p. (IMMR—31-PD19-77). NTIS PC A03/MF A01.

This study examines the economic issues that underlie the transport of coal over public roads. A not-insignificant amount of coal is moved by truck from the mine (usually a surface operation) to the rail tipple, over public roads. In the process, road surfaces are often damaged because these roads were not constructed to withstand the heavy loads placed upon them nor the intensity of traffic. The issue examined here is...who should pay for the upkeep and maintenance of these roads or the construction of new ones. The analysis used is the traditional tool of economic reasoning applied to a problem of this type.

44126 (PB—274406) **Clean coal combustion through coal washing and blending.** Stewart, O.W.; Shou, J.K. (Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). May 1977. 27p. (IMMR—29-PD18-77). NTIS PC A03/MF A01.

A brief review of study and investigative work directed to the beneficiation of Kentucky coals is presented. The work included general property analysis, pyritic sulfur reduction by the float-sink method, combustion characteristics of selected coals and coal blends, and characteristics of resulting ash. The technical and economical aspects of high sulfur coal utilization through blending and washing, and stack gas cleanup strategies are discussed.

44127 **Coal handling and coal burning for electricity generation in large power stations in the Federal Republic of Germany.** Koch, H.; Teloeken, R. (VEBA-Kraftwerke Ruhr A.G., Gelsenkirchen (Germany, F.R.)). *VGB Kraftwerkstech.;* **57**: No. 12, 789-799(Dec 1977). (In German).

In the last seven years (1970 - 1976 inclusive) an average of about 32 million tonnes of hard coal per year has been used in power stations in the Federal Republic of Germany. The lowest figure during this period was 24.5 million tonnes in 1975; in 1976 the figure was 31 million tonnes, which corresponded to a 30% proportion of total electricity generation. The paper deals with: Coal transport and handling, rail transport, transport by inland shipping, transport in ocean-going ships, coal storage and coal handling plant, coal preparation, coal burning, ash disposal and utilization, ash yield and residue - in the Federal Republic in 1975, utilization possibilities, emission and immission problems, and flue gas emissions.

44128 **High-value energy needs more efficient conversion, transport.** Uhl, A.E. *Oil Gas J.;* **75**: No. 31, 59-74(1 Aug 1977).

This paper considers the various options for transporting different fuels (gaseous, liquid and solid). The relative efficiencies and the economics of several transportation systems and alternative fuel conversion systems are discussed. It is stated that coal slurry pipelines can be as efficient as oil pipelines on a Btu/Btu basis.

44129 **Bunkering and storing coal for large power plants.** Glanz, W. *Dtsch. Hebe- Foerdertech.;* **22**: No. 9, 41-44(Sep 1976).

The storage of coal in horizontal or vertical stockpile necessitates differing handling methods and systems which must answer the requiremnts both of increased availability and economic suitability for large power plants.

44130 **Plastic properties of coals and their briquetting.** Taits, E.M. *Solid Fuel Chem. (USSR) (Engl. Transl.);* **10**: No. 5, 41-45(1976).

As a result of experiments on the briquetting of coals of different ranks, it has been found that after a sharp decrease in the strength of coal briquettes on passing from soft brown coals to young hard coals there is some increase in strength of the briquettes with a yield of volatile matter of 20-25%. This is connected with a change in the plastic properties of the coals. The role of capillary forces in the formation of coal briquettes is considered. A new method of briquetting coals of low cakability is proposed.

COMBUSTION

REFER ALSO TO CITATION(S) 44054, 44089, 44093, 44122, 44608, 44614, 44615, 45231

44131 (ANL/CEN/FE—77-8) **Supportive studies in fluidized-bed combustion. Quarterly report, July—September 1977.** Vogel, G.J.; Johnson, I.; Lee, S.H. (Argonne National Lab., Ill. (USA)). 1977. Contract W-31-109-ENG-38. 95p. Dep. NTIS, PC A05/MF A01.

These studies support the development studies for atmospheric and pressurized fluidized-bed coal combustion. Laboratory and bench-scale (process development unit) studies are aimed at providing needed information on regeneration process development, control of alkali metal and SO_2 emissions during combustion, particle loadings in the flue gas, and other tasks. Characterization of a variety of limestones and dolomites from various parts of the country for suitability in fluidized-bed combustors is also included. Reducing the volume of solid wastes to reduce their environmental impact is a major goal of this program. These studies are designed to supply data essential for the application of fluidized-bed combustion units to public utility and industrial systems. This report presents information on: regeneration flowsheet development, the effects of feed and bed temperatures on regeneration, limestone characterization, enhancement of limestone reactivity by heat treatment, alkali metal emission during coal combustion, enhancement of the sulfation of limestone by NaCl additive, evaluation of on-line particle size analyzers, and flue gas cleaning studies.

44132 (CONF-780307—8) **Nucleation and evolution of slag droplets in coal combustion.** Im, K.H.; Chun, P.M. (Argonne National Lab., Ill. (USA)). 1978. Contract W-31-109-ENG-38. 9p. Dep. NTIS, MF A01.

From 17. symposium on engineering aspects of MHD; Stanford, CA, USA (27 Mar 1978).

Portions of document are illegible.

Nucleation and droplet growth were analyzed for the slag vapor and droplet ridden combustion gas stream in an MHD channel. Numerical solutions were obtained for environments representing the flows through the channel and diffuser. It was found that the partial differential equation governing the droplets is very unstable because of the precipitous manner in which the nucleation rate varies and the strong dependence of the droplet growth rate on the droplet size. This difficulty was circumvented by a logarithmic transformation of the independent variable, r. The numerical solutions showed that evolution of the droplet size distribution proceeds through a succession of rather delicate balances between the size-dependent condensation and evaporation rates and the nucleation rate. These balances are largely dictated by the supersaturation ratio. Growth at an early stage of the submicron size droplets and the subsequent nucleation of the extremely small droplets engender a bimodal size distribution at the end of the channel or at the beginning of the diffuser depending on the supersaturation ratio. This

bimodal nature is preserved through the diffuser. Higher slag mass content of the gas stream was found to result in a more pronounced bimodal distribution at the end of the diffuser. Also, the higher slag content was found to accelerate the growth such that the entire spectrum is squeezed toward the larger-radius region of the size spectrum. Consequently, the average size of the droplets is larger at the end of the diffuser when the slag content is raised.

44133 (FE—2451-5) **Gas—solids interactions in the distribution zone of a fluidized bed: Phase I. Quarterly report, May 1—July 31, 1977.** Kirwan, D.J.; Vines, S. (Virginia Univ., Charlottesville (USA)). Mar 1978. Contract EX-76-S-01-2451. 39p. Dep. NTIS, PC A03/MF A01.

New data is presented in the probing of a 60 micron solids fluidized bed with gas entry velocity of 300 fps and superficial velocity of 2 fps using a miniature self heated thermistor probe. Three dimensional interfaces of the gas jet, non-moving solids, moving but non-fluidized solids, emulsion and bubble regimes are shown. Comparisons of interfaces for six combinations of entrance and superficial velocities are presented in graphical form. This completes planned work on the probing of single air entry units using 60 micron cracking catalyst. Probings were completed on two separate units using a larger diameter thermistor probe in a fluidized bed of 6-16 mesh limestone. The results indicate probable spouted bed performance so that equipment modification and further probings of this solid are indicated.

44134 (MERC/RI—78/3) **Fluidized-bed combustion test of low-quality fuels: Texas lignite and lignite refuse.** Mei, J.S.; Grimm, U.; Halow, J.S. (Department of Energy, Morgantown, W.Va. (USA). Morgantown Energy Research Center). Apr 1978. 48p. Dep. NTIS, PC A03/MF A01.

Lignites comprise about 29 percent of the Nation's solid fuel reserves and constitute a major potential source for future energy needs. Samples of Texas lignite from the Wilcox formation have been investigated at the Morgantown Energy Research Center, U.S. Department of Energy, to assess this fuel as a potential feedstock for fluidized-bed combustors. Combustion tests were performed over a wide range of operating conditions to develop fluidized-bed combustion (FBC) engineering and emissions data on this low-quality fuel. Desirable combustion characteristics observed include: no clinker formation at bed temperature as high as 2000°F, high sulfur retention capability of the mineral from lignite at bed temperature below 1600°F, and freeboard burning of carryover less than expected. Results of these tests indicate that lignite may be a particularly attractive solid fuel for industrial FBC applications. One potential problem with the use of this fuel is formation of very fine ash particles which are difficult to retain in the bed. Use of an attrition resistant bed material was required to maintain bed inventory.

44135 (NP—23211) **Coal utilization and conversion technologies: state-of-the-art.** Peterson, D.B. (California Energy Resources Conservation and Development Commission, Sacramento (USA). Alternatives Div.). Oct 1977. 146p. TIC.

This state-of-the-art review of coal conversion and utilization technologies is intended to serve as a resource document for members of the California Energy Resources Conservation and Development Commission. As a state-of-the-art review, it is intended more as a summary of the status of major utilization and conversion technologies than as a source of detailed technical information. In the United States as a whole about 45 percent of the electrical power generation is from coal-fired plants. In California, on the other hand, only about six percent of the electricity is from coal and all of that is from coal burned outside of the State. In view of the national commitment to increased use of coal, the consideration of coal utilization and conversion technologies will necessarily be an important factor in energy planning. The purpose of this paper is to review the current status of various coal utilization and conversion technologies.

44136 (SAND—78-8234) **Rates and mechanisms of pulverized coal combustion. First annual report.** Hardesty, D.R.; Pohl, J.H.; Stark, A.H. (Sandia Labs., Livermore, Calif. (USA)). May 1978. Contract EY-76-C-04-0789. 82p. Dep. NTIS, PC A05/MF A01.

This project consists of two major programs; a program of laboratory research on pulverized coal combustion and a program of technical assessment of pulverized coal combustion problems in utility and industrial boilers and advanced combustors and of related research requirements. The principal objectives and accomplishments to date in each program area are reviewed.

44137 Fluid bed combustion: boilers ordered but generators face severe problems. *Energy Res. Rep.;* **3**: No. 15, 1-2(15 Aug 1977).

Brief details are given of the present position in US research into pressurized fluidized bed combustion.

44138 U.S. utility to experiment with fluidised bed. *Electr. Times;* No. 4439, 20(12 Aug 1977).

American Electric Power have carried out a feasibility study of the use of pressurized fludized bed combustion in a combined cycle power generation plant. Details are given of the demonstration plant which is planned, and other fluidized bed combustion research projects.

MARKETING AND ECONOMICS

REFER ALSO TO CITATION(S) 44145

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 44116

44139 Reflections on working safety in bituminous coal mining. Zur Nieden, E. (Ruhrkohle A.G., Essen (Germany, F.R.)). *Bergbau;* **28**: No. 8, 290-293(Aug 1977). (In German).

Working safety comprises the following terms: accident prevention, protection of labour, health protection. For many years, accidents reported, accidents happened on the way to work, and vocational diseases have shown a downward movement for all accident insurance carriers in the Federal Republic of Germany. While promulgating the so-called Working Safety Act, the legislator conceded a special status to the mining industry in order to leave the efficient legal system covering the supervising activities of the Board of Mines essentially untouched. Long-term development trends of accidents and vocational diseases have shown crucial points and points of reference for the activities of specialists and company physicians in the field of working safety.

44140 Use of polymer solution for consolidation of coal seams. Moskalenko, E.M. *Ugol Ukr.;* **20**: No. 12, 36-37(Dec 1976). (In Russian).

The use of urea formaldehyde injected at 100—200 atm has proved effective in reducing gas emission by up to 85% and dust production by 70—80%. The effectiveness of injection was checked by nuclear magnetic resonance measurements.

REGULATIONS

44141 (PB—274632) **Energy and economic impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976). Final report.** (ICF, Inc., Washington, D.C. (USA)). Sep 1977. Contract EQ6AC016. 260p. NTIS PC A12/MF A01.

Additional industry costs and such non-cost factors as restrictions, timing and implementation of provisions, and adaptability of mine operators to new regulations are analyzed. Representative surface mine types are identified to model the effects of geographic, topographic, and operating characteristics.

44142 (PB—274633) **Energy and economic impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976). (appendices). Final report.** (ICF, Inc., Washington, D.C. (USA)). Sep 1977. Contract EQ6AC016. 344p. NTIS PC A15/MF A01.

A summary is given of coal surface mining reclamation laws by state, mine type characteristics, production data, methodology, support memoranda, and impacts of alluvial valley floor provisions in H.R. 13950.

44143 (PB—274660) **Recommendations for microbiological studies in the Continental Shelf Areas. Results from two workshops convened 10—11 August 1976 and 19—20 October 1976 in Boulder, Colorado. Outer Continental Shelf environmental assessment program. Technical memo.** (National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Marine Ecosystems Analysis Program Office). Oct 1977. 51p. (NOAA-TM-ERL-MESA—16). NTIS PC A04/MF A01.

During the preparation of a five-year plan for the Bureau of Land Management-supported studies, to be conducted in the Alaskan Outer Continental Shelf (OCS) before oil and gas development, workshop participants were asked to draw up and provide techniques for the following studies: general characterization of the existing microbial populations; the effect of human activities on natural microbiological communities and their functioning; the effect of natural microbial communities on OCS activities; and requirements for supporting data and information on related processes. Temperature, salinity and inorganic nutrient data are some of the parameters considered. This report contains a detailed listing of microbiological studies that the group agreed should be included in marine assessment programs and it also contains a section explaining the necessary sampling procedures and requirements, in order to standardize these techniques.

44144 B.C. policy to boost coal development. *Can. Min. J.;* **98**: No. 7, 50(Jul 1977).

British Columbia has issued a policy setting priorities and guidelines for development of the Province's rich metallurgical coal deposits by private enterprise. The policy aims to promote the coal industry within the province. A minimum royalty of 1.50 dollars per long ton, plus mining and provincial income taxes, will be maintained, but improvements to tax system are being studied. The system of coal rights disposal will be changed to remove areas of ministerial discretion. The policy also emphasizes that B.C. coal sold outside the province must be purchased at world competitive prices.

44145 Legislation: energy law. Act amending the third electricity generation act. Staeuber. *Recht Steuern Gas- Wasserfach;* **7**: No. 7-8, 25-28(1 Jul 1976). (In German).

The third electricity generation act aims at a guaranteed use of an average 33 Mtce a year, and a minimum of 30 Mtce, of German black coal in the electricity industry. In fact only some 22 Mtce found application in 1975, mainly due to reduced electricity consumption. The act amending the third electricity generation act is intended to provide additional financial incentives in 1976 and 1977 for an increased use of German black coal in the power industry in order to achieve the goals.

PETROLEUM

REFER ALSO TO CITATION(S) 44021

GEOLOGY AND EXPLORATION

REFER ALSO TO CITATION(S) 44883, 45435

44146 Experimental diagenetic study of a modern lipid-rich sediment. Harrison, W.E. (Louisiana State Univ., Baton Rouge). *Chem. Geol.;* **21**: No. 3-4, 315-334(Feb 1978).

Holocene organic-rich sediments were subjected to a series of laboratory experiments in order to evaluate the relative importance of temperature, pressure, the presence/absence of soluble lipids and nascent atmospheric conditions on generated products. Samples were heated at 80, 160 and 240°C for 50 h and the hexane-, benzene- and chloroform-soluble fractions were determined at the conclusion of each experiment. C_{12}-C_{30} alphatic fatty acids and C_{15}-C_{32} n-paraffins were analyzed individually. Maximum n-paraffin yields occurred at the highest temperatures; these paraffins were derived from the insoluble organic material (kerogen) as well as decarboxylation of fatty acids. The odd-C dominance of paraffins from the original sediments disappears as a function of temperature thus laboratory studies parallel observations made by Philippi on natural diagenesis. Fatty acids from both lipid-extracted and unextracted samples retain an even-C dominance at 240°C. At 160°C, fatty acids are released from the kerogen matrix at rates exceeding their degradation. An analysis of variance (ANOVA) was conducted. The ANOVA indicated that, for conditions employed in the study, the only factors which affected variation in components measured at the end of each experiment were: (1) organic matrix (presence/absence of soluble lipids); (2) temperature; and (3) the organic matrix-temperature insteraction.

44147 Log-inject-log in sand consolidation. Murphy, R.P.; Spurlock, J.W. (to Standard Oil Co.). US Patent 4,052,613. 4 Oct 1977. Filed date 8 Apr 1976. 6p.

A method is described for gathering information for the determination of the adequacy of placement of sand consolidating plastic for sand control in oil and gas wells. The method uses a high neutron cross-section tracer which becomes part of the plastic and uses pulsed neutron logging before and after injection of the plastic. Preferably, the method uses lithium, boron, indium, and/or cadmium tracers. Boron oxide is especially useful and can be dissolved in alcohol and mixed with the plastic ingredients.

44148 Geological conditions of petroleum formation and accumulations on ancient platforms. Sokolov, B.A. (Moscow State Univ.). *J. Geophys. Res.;* **19**: No. 2, 201-207(Feb 1977).

Translated from Geologiya i Razvedka; No. 5, 13-20(1976).

Features of petroleum occurrences for the East European and East Siberian platforms are considered. Within these platforms, there are two types of petroliferous basins: intraplatformal and folded-platformal. The intraplatformal basins are characterized by a four-phase sequence of development; rifting phase, early-syneclise phase, late-syneclise phase, and closing denudation-inversion phase. Four phases in the development of the folded-platformal basins are: proto-platformal, pericratonic, marginal downwarp, and denudation-inversion. These phases are discussed. (LK)

44149 Experience in application of a probability model for interpreting the results of geological and well logging studies of fractured reservoirs. Dech, V.N. (Vsesoyuznyj Nauchno-Issledovatel'skij Geologorazvedochnyj Inst., Leningrad (USSR)). *Geol. Nefti Gaza;* No. 3, 61-68(1975). (In Russian).

Probability (stochastic) modelling was used for the interpretation of geophysical methods of investigating fissure collectors of petroleum and gas (by neutron gamma-logging and lateral logging). The stochastic model used was based on modern ideas of the formation of porousness in carbonate rocks. The model was run on a computer. Examples are given of interpretations by the method described of two boreholes revealing carbonate sections of the Ordovician in the Baltic republics and the upper chalk in the eastern Caucasian foothills.

DRILLING AND PRODUCTION

REFER ALSO TO CITATION(S) 44052, 45358

44150 (CONF-770757—) **Oil and Gas Compact Bulletin. Volume 36, Number 1, July 1977.** (Interstate Oil Compact Commission, Oklahoma City, Okla. (USA)). 1977. 71p. Interstate Oil Compact Commission, Oklahoma City, OK.

From Midyear meeting; Nashville, TN, USA (10 Jul 1977).

The Interstate Oil Compact Commission represents 36 states working together to promote and encourage the conservation of oil and gas. This document comprises chiefly reports of committees and from states and official observers.

44151 (ORO—5301-7) **Oil recovery by carbon dioxide injection. Quarterly report, October—December 1976.** SanFilippo, G.P. (Pennzoil Co., Vienna, W.Va. (USA)). Mar 1977. Contract EF-76-C-05-5301. 43p. Dep. NTIS, PC A03/MF A01.

Carbon dioxide injection is scheduled to start during the first quarter of 1978. All well work has been completed with the exception of initial water injection into the six pattern wells. Besides the four back-up water injection wells originally scheduled, two additional back-up water injection wells were drilled as dictated by a model study. Construction lacks only the installation of the carbon dioxide storage and pumping facilities and the completion of the producing facilities. Quantitative information acquired from the core analyses and bottom hole pressure tests equates with the original data used as the basis of this project. Therefore, the original concept of successful miscible carbon dioxide oil recovery is supported by the information gained.

44152 (SAN—1396-15) **Improved secondary oil recovery by controlled water flooding-pilot demonstration, Ranger Zone, Fault Block VII, Wilmington Field: Phase I. Quarterly report, October—December 1977.** (Long Beach, City of, Calif. (USA)). 20 Jan 1978. Contract EF-77-C-03-1396. 35p. Dep. NTIS, PC A03/MF A01.

Progress in an improved waterflood demonstration of caustic waterflooding in a typical, well flood pattern of the Ranger Zone of the Long Beach Unit portion of the Wilmington Field is reported. Two alkaline flood processes are to be tested in this demonstration. The laboratory core flood testing continued to progress at a reasonable pace. Comparative core floods to date using the entrapment process (caustic with no salt) have not been encouraging although the concentration and volume of caustic may have been too low. The entrainment process core floods (caustic and salt) appear promising when the caustic concentration and volume are increased. Additional oil-water caustic dehydration testing will be undertaken. While results have not been quantified, softening of Long Beach Unit's produced water for caustic injection with resins appears to be technically practical; economics of this still must be evaluated, however. With encouragement having been obtained from the preliminary caustic-salt floods, facility design, procurement and installation work is again moving forward. The mini-injection test indicated injectivity of the area would be adequate but did point to some unanticipated problems in chemistry, either in the area of analysis techniques or the equilibrium between various alkaline ions.

44153 (SAND—78-0313) **DEEP STEAM: Project 16 enhanced oil recovery. Quarterly report, October 1—December 31, 1977.** Traeger, R.K.; Fox, R.L.; Magnani, N.J. (Sandia Labs., Albuquerque, N.Mex. (USA)). Apr 1978. Contract EY-76-C-04-0789. 35p. Dep. NTIS, PC A03/MF A01.

Project DEEP STEAM has been initiated at Sandia Laboratories although formal approval by DOE has not been received during the time covered by this report. The extension of surface steam injection to greater depth through completion modifications is being examined numerically. Designs for downhole steam generators are under study. The designs include an H_2-O_2 rocket engine,

electrical heater, and a liquid-fueled steam generator. A materials study of solutions to current steam and fire flooding problems has been initiated. A characteristic corrosive gas composition has been defined for fire flood exit gases and studies on materials have been initiated. No new contracts have been initiated during this period.

44154 Full-opening annulus pressure operated sampler valve with reverse circulation valve. Jessup, R.L. (to Halliburton Co.). US Patent 4,063,593. 20 Dec 1977. Filed date 16 Feb 1977. 14p.

A normally open oil well sampler valve which provides a fully open testing flow path therethrough is presented, wherein the sampler valve is closed under hydraulic control after a predetermined pressure increase in the well annulus pressure. The sampler includes two spaced apart ball valves having a sample chamber therebetween. The operating mechanism moves the ball valves from the open to the closed position simultaneously, and provides a hydraulic lock as well as a mechanical lock to prevent the balls from reopening in the well. The apparatus further includes a circulation valve which is opened after the closing of the sampler valve. One of the ball valves of the apparatus may be selectively removed to provide a single ball, safety closure valve when a well fluid sample is not desired.

44155 Self-operating chemical feeder for an oil well. Harrison, R.J. (to Texaco Inc.). US Patent 4,059,149. 22 Nov 1977. Filed date 18 Oct 1976. 6p.

A self-operating chemical feeder for an oil well is disclosed comprising a new combination of valves, timers, a pump, an injection line, a flush line, and a tank of chemical wherein a first valve is responsive to a first timer for repeatedly ejecting spaced apart consecutive precise slugs of a chemical to the injection line for delivery to the oil well and for spacing each of the slugs from the next consecutive slug by a predetermined precise period of time. A second valve is responsive to a second timer for ejecting spaced apart slugs of flush liquid to the injection line, one flush liquid slug for each chemical slug, and for spacing each of the flush liquid slugs by a predetermined precise period of time for insuring oil well treatment on a regular basis as scheduled and for eliminating personnel time required for manually flushing each precise slug of said chemical throughout the well for an extended period of time.

44156 Anchoring assembly. Manderscheid, P.H. (to Brown Oil Tools, Inc.). US Patent 4,059,150. 22 Nov 1977. Filed date 9 Feb 1976. 16p.

Disclosed is an anchoring assembly for anchoring well equipment within a surrounding well conduit. In one form of the invention, the anchoring assembly is specifically described for use as an hydraulically set, retrievable liner hanger. A modified form of the invention describes the anchoring assembly employed with a seal to function as an hydraulically set, retrievable well packer.

44157 Method and device for the thermal insulation of a deep well. Bayless, J.H.; Penberthy, W.L. (to Esso Production Research Co., Houston, Tex. (USA)). German(FRG) Patent 1,965,342/C/. 12 May 1977. 6p. (In German).

In drilling natural oil wells, there is a necessity to insulate the tube against the annular space which is formed by the feed tube and the tube, against excessive heat loss. According to the invention this is provided by soluble silicate material (silicates of the alkali metals except lithium silicate). After evaporation of the water in the solution, this forms a silicate foam deposit at least 3 mm thick on the tube. This silicate foam has a low thermal conductivity. Normally the deposition is carried out in the well, where steam is taken to the tube for evaporation. This process avoids deposition of silicate foam in the feed tube which would make the pulling through of tools more difficult or prevent it altogether. In exceptional cases if the silicate foam is to be surrounded by an insoluble layer of plastic or plastic resin, the deposition is carried out above ground. Many claims and examples describe further advantageous details of the design of the device and of the method of carrying out the process.

PROCESSING

44158 (PB—274450) Microspheres containing Nay zeolite synthesized from a South African kaolinite. (Precursor for a fluidized bed cracking catalyst). Howden, M.G. (Council for Scientific and Industrial Research, Pretoria (South Africa)). Sep 1977. 31p. NTIS PC A03/MF A01.

Hard microspheres having a diameter of 60 micrometers were prepared by spray drying and calcining a South African kaolinite. The microspheres were reacted with powdered metakaolinite and aqueous NaOH to produce NaY zeolite within the microspheres. The composition of the reaction mixture controlled the composition and concentration of the NaY. A product containing 25% NaY zeolite which has a $SiO_2/Al2O_3$ mole ratio of 5:1 to 5.5:1 can be prepared. This product appears suitable for conversion to a hydrocarbon cracking catalyst. Several methods of conversion are to be pursued.

44159 Process for improved carbon-supported hydrodesulfurization catalysts. Voorhies, J.D. (to American Cyanamid Co.). US Patent 4,082,652. 4 Apr 1978. Filed date 15 Jan 1976. 12p.

An improved carbon-supported hydrodesulfurization catalyst is obtained when the support first has deposited thereon a molybdenum compound convertible to MoS_2, said molybdenum compound is converted to MoS_2, and subsequently additional molybdenum compound, if necessary, and a metal compound selected from nickel and cobalt compounds are deposited thereon.

44160 Hydrocarbon hydroconversion process employing hydroxy-aluminum stabilized catalysts supports. Reed, M.G.; Jaffe, J. (to Chevron Research Co.). US Patent 4,060,480. 29 Nov 1977. Filed date 26 Nov 1973. 6p.

The disclosure provides a novel catalyst support. A method of making the support by treatment of prior art crystalline catalyst supports with hydroxy-aluminum solution is described. Hydrocarbon conversion processes are provided wherein the catalyst used therein includes the support.

44161 Fluidized cracking catalyst regeneration apparatus. Castagnos, L.F. Jr.; Pratt, R.E. (to Texaco Inc.). US Patent 4,060,395. 29 Nov 1977. Filed date 7 May 1976. 12p.

An apparatus is described for regeneration of spent coke contaminated fluidized cracking catalyst by burning coke therefrom using a molecular oxygen containing regeneration gas in a fluidized dense phase bed, and for burning substantially all carbon monoxide to carbon dioxide. Means are provided for transferring heat from the top of the regeneration apparatus to the bottom, employing catalyst as the transfer medium. Additionally, means are provided for maintaining a homogeneous fluidized dense phase bed of catalyst undergoing regeneration.

44162 Process for steam reforming of hydrocarbons. Kawagoshi, H.; Takeuchi, M.; Nakajima, F. (to Hitachi, Ltd.). US Patent 4,060,498. 29 Nov 1977. Priority date 2 Jun 1972, Japan. 14p.

A process is described for steam reforming of hydrocarbons utilizing a catalyst comprising at least 3 percent by weight, preferably 10, to 30 percent by weight of nickel per weight of the catalyst, at least 2 mg-atoms of silver per 100 g of the catalyst; if necessary at least one of rare earth elements such as lanthanum, cerium, yttrium, praseodymium, neodymium, or a mixture of rare earth elements in an atomic ratio of the rare earth elements to silver of 10 or less, preferably 0.2 to 2.0; and a heat-resistant oxide carrier such as alumina, silica, magnesia, titania, zirconia, beryllia, or thoria.

44163 Cooling of recycle hydrocarbon and/or alkylate product in isoparaffin-olefin alkylation. Chapman, C.C.; Hann, P.D. (to Phillips Petroleum Co.). US Patent 4,059,649. 22 Nov 1977. Filed date 3 Aug 1976. 8p.

A process is described for alkylation of at least one isoparaffin with at least one olefin in the presence of an acid catalyst in which at least a portion of hydrocarbon liquid from the settler is flashed and used as indirect coolant in the alkylation process. The pressure of the liquid withdrawn from the settler is increased prior to flashing. The pressure imparted to the liquid is sufficiently high to allow hydrocarbon vapors containing acid to pass to a fractionator without the use of a compressor.

44164 Selective catalytic oxidation of hydrocarbons as a challenge to the chemical engineer. Emig, G. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Inst. fuer Technische Chemie 1). *Chem.-Ing.-Tech.;* **49**: No. 11, 865-873(Nov 1977). (In German).

In the conversion of the most important chemical raw materials, natural oil and natural gas, to intermediate or end products, selective catalytic oxidation plays an increasing role. This method makes it possible in many cases to use more economical, single-step processes instead of the older multi-step processes. Using the typical example of propylene oxidation or ammonoxidation, the problems encountered by chemical engineers in the development of a heterogeneous-catalytic method of oxidation are demonstrated. The importance of systematic catalyst development is stressed. General aspects of the development of novel processes or the improvement of existing catalytic processes are discussed.

44165 Fluidized-bed cracking plant. Bunn Jr.; Hack, W.L. (to Texaco Development Corp., New York (USA)). German(FRG) Patent 2,237,031/C/. 24 Mar 1977. 3p. (In German).

In cracking carbohydrates, apart from the required products, by-products are formed according to the conditions of the process, above all coke, which will settle out on the catalyst and therefore reduce its effectiveness. A special device is proposed for continuous extraction of the used catalyst from the reaction vessel, which is regenerated in a special regenerator and then returned to the reaction vessel. The catalyst is then evaporated at the lower end of the

reactor through nozzles directed inwards and outwards from ring main pipes, and is changed into a liquid condition near the rising pipes at the outlet end with upward nozzles. Many examples describe advantageous forms of apparatus for this device and possible applications.

44166 Method for the catalytic cracking of two hydrocarbon fractions and equipment to carry it out. Carson, D.B. (to Universal Oil Products Co., Des Plaines, Ill. (USA)). German(FRG) Patent 2,146,215/C/. 30 Sep 1976. 5p. (In German).

The patent claim deals with a method for the catalytic cracking of two heavy hydrocarbon fractions (gas oil, coke gas oil, vacuum gas oil) in a system with two reactors, namely a fluidized-bed reactor and a rising pipe reactor connected to it. One of the two hydrocarbon fractions is converted on a catalyst in the fluidized bed. A second heavy fraction together with fresh or freshly regenerated catalyst is introduced into the rising pipe reactor whilst the catalyst is being fed into the fluidized bed which has already passed through the rizing pipe reactor. The product of the rising pipe reactor is mixed with that of the fluidized bed and after catalyst separation via cyclones, it is fractionated. The initial material which has not been cracked (circuit oil) is recycled into the fluidized bed, where necessary after hydrogeneration. The patent claim also deals with the inlet and outlets for the final materials and product flows, separation and regeneration devices for the catalyst and their arrangement. It can be seen from the given examples that cracking with a high gasoline yield and only slight occurence of dry gases (particularly methane, ethane) is achieved with the invented method.

44167 Method for the separation of high-boiling hydrocarbons in normal paraffins and branch-chain hydrocarbons on molecular sieves. Avery, W.F. (to Union Carbide Corp., New York (USA)). German(FRG) Patent 1,545,408/C/. 16 Jun 1976. 7p. (In German).

The patent claim deals with an adsorption-desorption method for the separation of high-boiling hydrocarbons on molecular sieves with a pore size of 5 Angstroem at raised temperature (302 to 357°C) and raised pressure (1.4 to 4.55 kg/cm^2), consisting basically of 3 steps. In the first stage, kerosene vapours are passed through a molecular sieve bed charged with n-hexane, where normal paraffins are adsorbed and a first product flow occurs from the n-hexane and branch-chain hydrocarbons. In the second stage of the method the adsorbed layer, after interrupting the addition of kerosene, is washed with n-hexane vapours which are led in the same direction as the kerosene vapours. The third stage finally, namely passing n-hexane vapours in counter current through the molecular sieve bed for desorption, gives a second product flow consisting of normal paraffins and n-hexane. The temperature and pressure conditions remain the same for all three stages of the process. The desorption and washing agent is used again in the cycle. In a described example performed, a system of three molecular sieve beds is used. The average purity of the separated normal paraffins was 98.8 wt.%.

44168 Method to desulphurize crude petroleums, heavy fuel oils and similar heavy oils. Crouch, W.B.; Jesse, D.R. (to Texaco Development Corp., New York (USA)). German(FRG) Patent 2,415,627/C/. 16 Oct 1975. 9p. (In German).

Frequently, hydrogenating methods alone are not suitable for the refinement of heavy oil fractions or petroleums due to the very large hydrogen consumption. The proposed method avoids this difficulty, especially when applied to heavy oils which only contain a small amount of heavy petrol. Heavy oil is mixed with hydrogen in a tube furnace, subjected to visbreaking and then under pressure enters a stripper column in which it is thermally cracked. Heavy petrol vapour mixed with hydrogen is introduced into the column from below; the heavy petrol vapour acts as stripper, the hydrogen brings about a non-catalytic hydrogenating raffination mainly forming hydrogen sulphide. Gaseous components and heavy petrol vapours are drawn off at the top of the column which are then converted in a hydrocracker. A residue is removed at the bottom of the column containing large amounts of vanadium and sulphur compounds contained in heavy oil and which is less than 25% of the heavy oil used quantity-wise. The product from the hydrocracker is freed from hydrogen in a separator which is recycled; the liquid is distilled. Three product flows are removed here: a gas, containing H_2S, CO_2 and H_2 and which goes to the Claus apparatus, a liquid refined product and finally heavy petrol which after heating is put back into the stripper column. The method thus enables one to refine a sulphur-rich heavy oil using relatively little hydrogen and giving a high yield of liquid products.

44169 Catalyst for the treatment of hydrocarbons with hydrogen and method for its preparation. Weisang, J.E.; Engelhard, P. (to Compagnie Francaise de Raffinage, 75 - Paris). German(FRG) Patent 2,460,560/A/. 14 Aug 1975. 20p. (In German).

The patent deals with a catalyst and its preparation which can be used in the catalytic treatment of hydrocarbons with hydrogen, in particular in the treatment of petroleum fractions in the region of distillation of benzone and naphtha with hydrogen. The object was to achieve a higher octane number of the product concerned and a better liquid yield than has been obtained so far using the conventional catalysts platinum or some other platinum metal on a refractory, mineral oxide. The catalyst according to the invention on aluminium oxide carrier material preferably contains 0.10 to 0.70 wt.% platinum metal, 0.02 to 0.60 wt.% molybdenum or chromium or manganese, 0.05 to 1.00 wt.% tin, 0.5 to 1.6 wt.% chlorine and 0.05 to 0.5 wt.% sulphur each relative to the total weight of the catalyst. The patent claims furthermore concern the specific surface and the pore volume, the type of impregnation of the carrier with subsequent calcination, and a final reduction and sulphurization treatment of the catalyst. The effectiveness of the catalysts is illustrated by examples.

44170 Method to desulphurize heavy mineral oils. Durkin, J.A.; Patel, J.A.; Kravitz, S.; Mather, W.B. Jr. (to Texaco Development Corp., New York (USA)). German(FRG) Patent 2,458,021/A/. 12 Jun 1975. 25p. (In German).

The methods commonly used in the mineral oil industry to desulphurize residual oils mainly work with fixed assigned catalysts of Co-Mo-Al_2O_3 or Ni-W-Al_2O_3. In order to compensate for the activity less of these catalysts, the reactor temperature is increased during operation. This normally takes place between 330 and 400°C. At temperatures above 400°C, the rate of deactivation of the catalyst is generally so high that one cannot further increase the temperature. Most methods are operated at liquid space velocity of IV/V/h. The following invention consists in increasing the temperature as well as the liquid space velocity. One thus achieves that at constant degree of desulphurization, the hydrogen consumption is greatly reduced and is thus cost-saving. However, the operational pressure must not go below a lower limit of about 35 above atmospheric pressure in order to avoid an increase of the deactivation rate. This limitation can be got by if instead of using the common catalysts consisting of Co/Ni and Mo/W on Al_2O_3, those are used where small amounts of 7th subgroup, in particular manganese or rhenium or of platinum, rhodium or iridium have been added. The deactivation rates, as shown in all experimental cases, even at pressures well below 35 atue, are smaller than those catalysts not containing the above-mentioned metal additions.

PRODUCTS AND BY-PRODUCTS

REFER ALSO TO CITATION(S) 44329, 44330

44171 Process of hydrodesulfurization and separate solvent extraction of distillate and deasphalted residual lubricating oil fractions. Murphy, H.C. Jr.; Stauffer, H.C. (to Gulf Research and Development Co.). US Patent 4,085,036. 18 Apr 1978. Filed date 1 Oct 1976. 8p.

A process is claimed for the production of lubricating oils from petroleum stocks containing significant quantities of sulfur and lubricating oil components boiling above about 650°F (343°C) by subjecting such stocks to a series of steps comprising hydrodesulfurization, fractionation, and solvent extraction. The residual fraction obtained from the fractionation step may be deasphalted prior to solvent extraction.

44172 Natural resources of the earth. Relations between raw materials and energy. *Lichbogen;* **25**: No. 4, 12-21(1976). (In German).

The Chemische Werke Huels exemplifies how the change from carbon chemistry to petrochemistry for the production of plastics has taken place. 95% of all organic chemicals are being generated on the basis of petrochemicals. Utmost profitability is being achieved by means of a far-reaching network of pipelines. The most important basic product of petro-chemistry is naphtha or straight-run gasoline, occuring among other fractions during petroleum processing due to fractionation, and reforming processes. 40% of them will go into the chemical industry (60% into the fuel sector) and more than 50% into polymer chemistry. In tabular form it is shown how plastics that can be produced today are produced on the basis of coal as well as on the basis of naphtha. The production of plastics and their consumption (1955-1975) in Germany as well as throughout the world show the rapid development of this industrial branch, which, together with the overall economic recession, came to a halt for the first time in 1975.

44173 Method for the separation of styrene from thermally cracked petroleum. Morimoto, Giroshi; Tatsumi, Masanori; Kamakura, Kanagawa. (to Toray Industries, Inc., Tokyo (Japan)). German(FRG) Patent 2,135,622/C/. 23 Oct 1975. 6p. (In German).

The patented method deals with the separation of styrene from the petroleum fraction boiling between 120 and 160°C using an extractive distillation in which xylene and higher-boiling materials are removed. Polar solutions are used such as, e.g., dimethyl acetamide, beta-methyl propionitrile, butyl lactone amongst others, in which styrene is dissolved. A polymerization inhibitor is simulta-

neously added where potanium or sodium nitrite with additions of, e.g., p-test. Butyl catechin, hydroquinone or p-benzoquinone prove to be particularly suitable for the extractive distillation fraction between 100 and 135°C. The styrene-contained fraction yielded is distilled again after washing with nitric acid and then with water or aqueous alkali solution to free it from interfering impurities. A colourless, transparent styrene product is obtained having a purity of 99.8% which after hot polymerization gave a colourless polymer with good physical properties.

MARKETING AND ECONOMICS

44174 Oil industry in Austria during 1976. *Erdoel-Erdgas Z.;* **93**: No. 10, 358-362(Oct 1977). (In German).

In contrast to the development of consumption of the two previous years, Austrian consumption of mineral oil products rose again in 1976. With a total consumption of 10.8 million tonnes, there was a growth of 8.3% compared to the previous year. This increase of consumption was not the same for all products. The total result is based, first of all, on the extraordinarily high demand for heating oil for thermal power stations. In view of this increase of demand, the crude oil processing was 1 million tonnes or about 13% higher than in 1975. With decreasing domestic oil production, crude oil imports rose by 20.2%. Finished products increased similarly. The total Austrian consumption was covered by 77% of domestic processing and 23% imported products. Here again there was a small change towards domestic production compared to 1975. There was a similar picture for the natural gas sector. A demand reduced by 9.1% compares with increased imports of 871 million cu. metres of natural gas. The total natural gas supply could be increased by 16.6% compared with the previuos year. The value of production by the Austrian natural oil industry in 1976 was about 23 billion Schillings.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 45326, 45328, 45329, 45333, 45334, 45408, 45409, 45410, 45411, 45413, 45417, 45418

44175 Long-term fate of petroleum hydrocarbons after spills: compositional changes and microbial degradation. Butler, J.N. (Harvard Univ., Cambridge, MA); Levy, E.M. *J. Fish. Res. Board Can.;* **35**: No. 5, 604-605(May 1978).

Session I of the Symposium on Recovery Potential of Oiled Marine Northern Environments dealt with the long-term changes in the composition of oil when it is exposed to the marine environment. The potential for recovery exists but may take many years. The rate of recovery depends on the type and amount of oil, and upon the energy needed to disperse and degrade the oil. The single most important type of energy is provided by wind and waves at the time of the spill. The second physical process, evaporation, removes the more volatile hydrocarbons from spilled oil. Dispersion greatly increases the surface area of the oil and renders it more susceptible to chemical and biological degradation. Biodegradation may not be as important for eliminating petroleum from cold marine environments as had previously been believed. Information presented in Session I suggested that every spill incident studied thus far is nearly unique.

44176 Prudhoe crude oil in Arctic marine ice, water, and sediment ecosystems: degradation and interactions with microbial and benthic communities. Atlas, R.M.; Horowitz, A.; Busdosh, M. (Univ. of Louisville, KY). *J. Fish. Res. Board Can.;* **35**: No. 5, 585-590(May 1978).

A variety of in situ models were used to simulate oil spills in different arctic ecosystems. Numbers of oil-degrading microorganisms were found to increase after oil contamination. Oil contamination of sediment resulted in mortality of indigenous invertebrates. Recolonization of oil-contaminated sediments began shortly after oil contamination but benthic communities were significantly different in oil-contaminated sediment compared with the control, 2 mo after oil contamination. Petroleum hydrocarbons were degraded slowly. Ice greatly restricted losses of light hydrocarbons. Following initial abiotic losses, biodegradation of oil was limited and did not significantly alter the relative percentages of hydrocarbons in the residual oil. We concluded that petroleum hydrocarbons will remain in arctic ecosystems for proloned periods after oil contamination.

44177 Residues of Bunker C oil in Chedabucto Bay, Nova Scotia, 6 years after the Arrow spill. Keizer, P.D.; Ahern, T.P.; Dale, J.; Vandermeulen, J.H. (Bedford Inst. of Oceanography, Dartmouth, Nova Scotia). *J. Fish. Res. Board Can.;* **35**: No. 5, 528-535(May 1978).

The Arrow spill in February 1970 heavily oiled approximately one half of the 600 km shoreline of Chedabucto Bay, Nova Scotia. An extensive field survey and chemical analysis of sediment samples for aliphatic and polycyclic aromatic hydrocarbons identified only a few locations where Arrow Bunker C remained in the intertidal and sublittoral sediments. The upper intertidal zones of Rabbit, Crichton, and Durell islands remain covered with an oil and sediment mixture of a "pavement-like" consistency. Several areas showed visual and chemical evidence of recent spills during the survey period. All sublittoral sediment samples contained hydrocarbons of petroleum origin. The distribution of the most highly contaminated sublittoral sediments suggests either reentry of stranded oil into the water column and into the sublittoral sediments or contamination from shipping and fishing vessels. Concentrations in the sublittoral sediments are below those found toxic to benthic organisms. An estimation of the amount of Bunker C remaining in Chedabucto Bay is impossible due to the patchy distribution, contributions of more recent spills, and the absence of adequate control sites.

44178 Preliminary assessment of the presence of oil in the ecosystem at Ekofisk after the blowout, April 22—30, 1977. Mackie, P.R.; Hardy, R.; Whittle, K.J. (Torry Research Station, Aberdeen, Scotland). *J. Fish. Res. Board Can.;* **35**: No. 5, 544-551(May 1978).

The marine environment in the Ekofisk area was assayed for the presence of oil components after the blowout on Platform Bravo was brought under control. Several methods of assay were used but the results were not always strictly comparable. Relatively high fluorescence values were observed in water samples in the vicinity of the platform. However, gas-liquid chromatography of these samples indicated that although some of the hydrocarbon fractions now resembled crude oil, none had increased markedly in concentration. The presence of oil could be detected in the biota and taste panels were able to identify an oily taint at low level in some fish caught near the platform. A second survey some 2 mo after the spill indicated that little, if any, oil from the blowout remained in the water column.

44179 Oiled seabird rescue and conservation. Clark, R.B. (Univ. of Newcastle upon Tyne, Eng.). *J. Fish. Res. Board Can.;* **35**: No. 5, 675-678(May 1978).

Attempts were made to clean and rehabilitate nearly 8000 oiled birds (mainly auks) following the wreck of the Torrey Canyon. This was an almost total failure and a Research Unit on the Rehabilitation of Oiled Seabirds was established in Newcastle upon Tyne to devise effective treatment methods. This has involved a study of the mechanism of water-repellency in seabird plumage and led to the development of cheap, effective cleaning methods and full recovery of the birds within 2-3 wk. of capture. These methods have been used successfully on small numbers of birds by amateurs and also operationally on larger numbers by the Research Unit. There have been only few ringing returns but at least some of the cleaned birds became reintegrated with the breeding populations after release. Even with appropriate organization and facilities it is doubtful whether the rescue and treatment of oiled birds can make a material contribution to seabird conservation, but there is often strong public pressure for the treatment of oiled birds and the development of suitable techniques makes this possible.

44180 Recolonization of rocky shores in Cornwall after use of toxic dispersants to clean up the Torrey Canyon spill. Southward, A.J.; Southward, E.C. (Marine Biological Association, Plymouth, Eng.). *J. Fish. Res. Board Can.;* **35**: No. 5, 682-706(May 1978).

Fourteen thousand tons of Kuwait crude oil, reduced from 18,000 tons by weathering at sea, was stranded along 150 km of the coast of West Cornwall, England, in March 1967. The oil was treated with 10,000 tons of toxic dispersants during cleaning operations. By itself the oil was not very toxic, although it killed some limpets and barnacles, and most of the mortalities that followed cleaning were due to the dispersants. Most animals and some algae were killed on the shores treated heavily with dispersants, while a few animals and most algae survived in places less heavily treated. Long stretches of coast were contaminated to some extent by drifting of patches of oil and dispersants along the shore and by indiscriminate dispersant use in remote coves. Recolonization involved a rapid "greening" by the alga Enteromorpha; then a heavy settlement and growth of perennial brown algae (Fucus species), leading to loss of surviving barnacles. A settlement of limpets and other grazing animals followed, with eventual removal or loss of the brown algae. The final phases were a reduction in the limpet population and a resettlement of barnacles. Lightly oiled, wave-beaten rocks that received light dispersant treatment showed the most complete return to normal, taking about 5-8 yr; heavily oiled places that received repeated application of dispersants have taken 9-10 yr and may not be completely normal yet. Most common species returned within 10 yr, but one rare hermit crab is still missing from places directly treated with dispersants.

44181 Florida oil spill impact on the Buzzards Bay benthic fauna: West Falmouth. Sanders, H.L. (Woods Hole Oceanographic Inst., MA). *J. Fish. Res. Board Can.;* **35**: No. 5, 717-730(May 1978).

No matter what criterion is used to measure the effects of the Florida oil spill, the densities and species composition and the array of statistical methods demonstrate that the same hierarchical pattern emerges. Densities and species composition remain stable over time at the minimally oiled and unoiled stations, but display considerable fluctuations and marked changes at the more heavily oiled stations. With simple presence or absence data, highest fidelity is present at the marginally oiled stations, lower fidelity at the intermediately oiled stations, and lowest fidelity at the severely oiled stations. The discrepancy index measures mean yearly differences in faunal composition at each of the stations. Very large and large differences are documented for the severely and intermediately oiled stations but only small differences are found for the marginally oiled stations. The coefficient of variation is a measure of faunal variability throughout the entire sampling period for each of the stations. Faunal variation remains very high at the severely and intermediately oiled stations but low at the marginally oiled sites. Cluster analysis reveals profound temporal changes in the fauna from samples collected at the severely and intermediately oiled stations but demonstrates a much more homogeneous pattern with only small seasonal changes from samples obtained at the marginally oiled stations.

44182 No. 2 fuel oil spill in Bourne, Massachusetts: immediate assessment of the effects of marine invertebrates and a 3-year study of growth and recovery of a salt marsh. Hampson, G.R. (Woods Hole Oceanographic Inst., MA); Moul, E.T. *J. Fish. Res. Board Can.;* **35**: No. 5, 731-744(May 1978).

On October 9, 1974 the oil barge Bouchard 65 loaded with 73,000 barrels of oil spilled an undetermined amount of No. 2 fuel oil off the west entrance of the Cape Cod Canal in Buzzards Bay, Massachusetts. Within the following 2-wk period, oil from the barge was found contained along the west side of Bassett's Island and inner Red Brook Harbor, a distance of 5.0 km from the site of the spillage. Qualitative samples of dead and moribund marine invertebrates were collected in tide pools and slight depressions along the beaches. A collection consisting of 4360 invertebrates comprising 105 species, plus 2 species of fish were found in 8 samples. Noticeable effects of the oil on the salt-marsh plant community were also observed. A detailed quantitative examination determined the effects of the oil on various components of the affected salt-marsh community in Winsor Cove compared to a selected control site. From data collected in September 1977, the marsh grass in the lower intertidal zone in Winsor Cove showed an inability to reestablish itself by either reseeding or rhizome growth. The associated sediments showed a correspondingly high concentration of petroleum hydrocarbons impregnated in the peat substrate. Erosion rates measured in the affected area, as a result of the 3-yr period of marsh degeneration, were 24 times greater than the control site. Microscopic algae were collected during the sampling period and those present were considered least sensitive to environmental changes. Examination of the interstitial fauna found in the study area in the summer of 1977 showed an extremely reduced number of individuals and species.

44183 Long-term effects of an oil spill on Fucus macrofauna in a small Baltic bay. Notini, M. (Swedish Water and Air Pollution Research Inst., Nykoeping). *J. Fish. Res. Board Can.;* **35**: No. 5, 745-753(May 1978).

On October 6, 1970, the small tanker Irini ran aground in the southern part of the Stockholm archipelago, releasing about 1000 t of medium and heavy fuel oil. Approximately 400 t drifted into a small bay, Gastviken, wiping out nearly the entire littoral fauna. Most of the oil was collected mechanically during the winter, and by May 1971 cleanup operations were completed. The recruitment of the bladder wrack (Fucus vesiculosus) community in the bay was observed at intervals over a 5-yr period. Significantly increased macrofauna population densities were found for a number of species in the 1974 and 1976 samples compared to those of 1971 and 1972. From June-July 1971 to June 1976, the mean numbers of individuals for all species rose from about 280 to 1000/100 g Fucus dry weight (d.w.). The bivalve Mytilus edulis increased in number from 0 to about 45, the gastropod Theodoxus fluviatilis from 0 to about 160, the amphipod Gammarus spp. from about 40 to 580, the isopods Idotea spp. from about 5 to 35, and Iaera spp. from almost 0 to about 10/100 g Fucus. Larvae of Chironomidae were the only group found with a decreased density between the first and sixth summers after the spill, with 240 and 145 individuals, respectively. The data obtained are discussed in relation to conditions in a nearby unpolluted bay and to normally occurring cyclic variations.

44184 Long-term effects of oil spills on marine intertidal communities. Mann, K.H. (Dalhousie Univ., Halifax, Nova Scotia); Clark, R.B. *J. Fish. Res. Board Can.;* **35**: No. 5, 791-795(May 1978).

Session III of the Proceedings of the Symposium on "Recovery Potential of Oiled Marine Northern Environments" documents the potential for recovery from oil spills. The rate of recovery depends on the toxicity and quantity of oil involved, the nature of the shoreline on which the oil is stranded, and the biology of the organisms that have been affected. Documenting the recovery potential should not lead to a lack of concern on the part of those responsible for prevention of oil pollution or cleanup. The problem of "controls", "standards", or "reference sites" is difficult because organisms in natural unpolluted marine ecosystems are inherently extremely variable. Attention should be shifted from single species to whole systems. Species diversity and productivity are valuable indexes for the measurement of ecosystems. Further work is needed in the area of determining an acceptable level of oil pollution. Detailed studies of processes such as microbial degradation of oil, tissue retention of hydrocarbons, and effects of hydrocarbons on the physiology of particular species, or on their population dynamics should be pursued with vigor. Oil spills are not the most long-lasting kind of environmental perturbation, but they are far too frequent, and steps to avoid the spills should be taken.

POLICY, LEGISLATION, AND REGULATION

44185 (DOE/EDP—0024) **Environmental Development Plan (EDP). Oil supply. FY 1977.** (Department of Energy, Washington, D.C. (USA)). May 1978. 178p. Dep. NTIS, PC A09/MF A01.

Environmental Development Plans (EDPs) are the basic ERDA management documents for the planning, budgeting, managing, and review of the broad environmental implications of each energy technology alternative in accordance with ERDA Immediate Action Directive (IAD) No. 0500-4, dated December 14, 1976. EDPs are designed to provide the framework for: incorporating environmental considerations into agency planning processes at the earliest stages; resolving environmental issues concurrently with energy technology development; assuring that environmental issues are competitive with technological, economic, and institutional issues in decision-making; and documentation of compliance with National Environmental Policy Act (NEPA). This Oil Supply EDP briefly describes the petroleum technology. The environmental, health, and safety issues and the environmental activities needed to resolve these issues are identified. An action plan for the evaluation and mitigation of environmental impacts, as well as a schedule for review and update of NEPA documents, are presented. The coordination and management strategy for conducting the environmental research program is discussed. This is the first Oil Supply EDP and it will be updated annually to take into account the progress of the technologies toward commercialization, the environmental work accomplished by ERDA and other agencies, the resolution of outstanding environmental issues concerning the technologies, and identification of decision points which require compliance with NEPA.

44186 (DOE/ERA—0006(Vol.2)) **Task force on compliance and enforcement. Final report. Volume 2.** (Federal Energy Administration, Washington, D.C. (USA)). Mar 1978. 480p. Dep. NTIS, PC A21/MF A01.

Recommendations for measures to strengthen the FEA enforcement program in the area of petroleum price regulation are presented. Results of task force efforts are presented in report and recommendations sections concerned with pending cases, compliance program organization, enforcement powers, compliance strategy, and audit staffing and techniques. (JRD)

44187 Jurisdiction and mining administration. Immediate enforcebility of an approved operation plan. *Glueckauf;* **113**: No. 21, 1061-1063(Nov 1977). (In German).

That the execution of an approved operation plan can be ensured by declaring the immediate enforcebility has been confirmed again by another decision in an administrative court case. In this context, the limited right of communities to file actions in operation plan procedures became obvious. A petroleum extraction company had presented the operation plan for constructing a slush pit to the appropriate mining authority. The approval of this plan by the authority was contested by the village, in the district of which the pit was to be erected. The grounds upon which the judgement of the administrative court is based are given in full.

TRANSPORT, PIPELINES, AND HANDLING

REFER ALSO TO CITATION(S) 44128

44188 Alaska oil starts flowing. Harms, K. *Oel;* **15**: No. 8, 227-232(Aug 1977). (In German).

By the end of July the first crude from Alaska has reached the port of Valdez. Thus the USA after ten years of development finally reap the fruits by way of new production which promises at least for some time to balance the falling trend of domestic crude output.

44189 (ANL-Trans—1131) **Acoustic leakage detection in pipelines.** Naudascher, E.; Martin, W.W. Translated from *Rohre, Rohrlei-*

tungsbau Rohrleitungstransp.; **14**: No. 8, 452-461(Dec 1975). 33p. Dep. NTIS, PC A03/MF A01.

The potential uses of a leakage-detecting mole are discussed, and the question as to whether leakages in an oil pipeline can be reliably detected under any operating conditions with the aid of an accoustic leakage detector is dealt with. The magnitude of "recognizable" leaks is shown in the form of significant dimensionless parameters as a function of the operating and pipeline characteristics so as to ensure the general validity of this relationship and the applicability of laboratory conditions to actual in-service conditions.

PROPERTIES

44190 Determining the gross and net calorific value of gaseous fuels. Lueck, K.; Altgeld, H. *Werkstattblatt.;* No. 663, 1-4(1977). (In German).

First, the terms 'gross' and 'net' calorific value are explained together with the units in which they are expressed. Description of the layout and experimental procedure of a Junkers calorimeter to determine the gross and net calorific value of gaseous fuels and volatile liquids. To facilitate evaluation, an exemplary calculation is given. Determination of the gross and net calorific value of propane. Table of the gross and net calorific values of some gaseous fuels.

44191 Additive for petroleum distillates. Miller, H.N. (to Exxon Research and Engineering Co., Linden, N.J. (USA)). German(FRG) Patent 1,900,838/C/. 12 May 1977. 3p. (In German).

An oil-free mixed polymer is proposed as the modifying material for crystalline wax or paraffin, mainly for the purpose of reducing the melting point or removing paraffin from carbohydrates. This is to be added to the amount of 0.001-2% by weight and should have a molecular weight of 500-50,000. The composition should preferably be 50-99% mol. ethylene and 1-50% mol. α,β unsaturated polymerisable compounds. Further claims propose suitable compounds for this.

NATURAL GAS

REFER ALSO TO CITATION(S) 44021

GEOLOGY AND EXPLORATION

REFER ALSO TO CITATION(S) 44149, 44883

44192 (N—77-33467) **Gassim. user's description: a gas reservoir simulation model.** Dalen, V. (Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering). 1 Jul 1976. Contract NTNF-B-1840.4683. 39p. (STF—71-A76020). NTIS PC A03/MF A01.

A reservoir simulation model, GASSIM, for areal analysis of single-phase gas flow in a porous medium is described. This program performs numerical simulation of the performance of a gas reservoir and is restricted to two-dimensional horizontal flow. The gas may be considered as an ideal gas or an empirically defined real gas. Based on the finite element method for spatial discretization and an implicit incremental formulation in time, GASSIM is quite general with respect to geometry, reservoir heterogeneities, and well conditions; the program has restart capabilities.

44193 (UCRL—80328) **Microcracks and matrix deformation in stressed gas-bearing sandstones.** Dengler, L.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.; California Univ., Berkeley (USA). Dept. of Geology and Geophysics). 3 Feb 1978. Contract W-7405-ENG-48. 7p. (CONF-770484—1). Dep. NTIS, PC A02/MF A01.

From Scanning electron microscope symposium; Los Angeles, CA, USA (18 Apr 1977).

The microstructure of laboratory and nuclear explosively deformed low-permeability sandstones is studied by SEM examination of ion-thinned polished thick sections. Samples prepared in this manner can be oriented relative to coordinate axes, enabling semiquantitative descriptions of pore structure and matrix deformation. The undeformed rock contains an intricate intergranular network of authigenic chlorite and kaolinite causing the average pore size to be 2—3 μm. Chlorite platelets are typically oriented in random directions. Uniaxial-strain testing causes elongation and bending of chlorite platelets. Preferential orientation of platelets perpendicular to the direction of applied stress is associated with increased strains. Grain fracturing rarely extends further than a grain diameter. The effect of uniaxial-stress testing depends on the confining pressure of the test. Fracturing occurs primarily at grain boundaries within the immediate fault zone in samples tested at less than 50 MPa confining pressure. Away from the fault, matrix and pore structure are essentially unaltered. At higher confining pressures, grain fracturing is common and occurs further from the fault, although rarely extending beyond a grain diameter. Compaction and preferential alignment of chlorites is common. At 600-MPa confining pressure, the pore size associated with chlorite-filled areas is less than a micron. Nuclear explosively deformed samples contain long macroscopic fractures oriented perpendicular to the shock-front direction. In the vicinity of these fractures, chlorite deformation is similar to that observed in the laboratory-tested samples. Away from these areas, the microstructure is unaltered.

44194 Natural gases in the south German Molasse Basin. Application of D/H and $^{13}C/^{12}C$ isotope analyses to deduce their origin. Schoell, M. (Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover (Germany, F.R.)). *Erdoel-Erdgas Z.;* **93**: No. 9, 311-322(Sep 1977). (In German).

Gas chromatographic and mass spectrometric analyses of the isotopic ratio, particularly of the component methane, in the natural gas of the sedimentary south German Molasse Basin have been executed in order to find at least a partial solution concerning the question of origin and migration of hydrocarbons. Trends have clearly emerged with regard to face and horizon of the extraction, related to the composition of gases as well as to the $^{13}C/^{12}C$ isotopic ratio. Measuring results are discussed with regard to the genesis of gases, allowing statements on the thermocatalytic maturity of parent rocks. Two conceptions have been developed for interpreting changes in the chemical and isotopic composition of natural gases.

DRILLING, PRODUCTION, AND PROCESSING

REFER ALSO TO CITATION(S) 44150, 44196

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 44888

ENVIRONMENTAL EFFECTS

REFER ALSO TO CITATION(S) 45328

44195 (UCRL—50016-78-1, pp 1-5) **Liquid-natural-gas spill-effects program.** 31 Mar 1978.

In Mechanical Engineering Department quarterly report, January—March 1978.

The preliminary test plan for assessing the effects of a LNG spill is described. The modeling and experimental programs are outlined. Instrumentation for the China Lake LNG tests is described; a 1,000-m^3 test facility at NTS is proposed.

ARTIFICIAL STIMULATION, PLOWSHARE, ETC.

REFER ALSO TO CITATION(S) 45285

44196 (NVO—0655-105) **Western gas sands project. Status report.** Atkinson, C.H. (Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center). 1 Mar 1978. Contract EY-76-C-08-0655. 52p. Dep. NTIS, PC A04/MF A01.

The progress during January, 1978 of the major government sponsored endeavors undertaken to increase gas production from the low permeability gas sands of the western United States is summarized. A core program meeting was held on January 25, 1978 at the CER Corporation office in Las Vegas, Nevada. The core tasks to be performed on the available core supply were enumerated and each participant at the meeting expressed the interest and capabilities of his organization for the execution of specific analyses. A log file and project file, which contain raw data and published reports from each Western Gas Sands Project contractor are being established. The USGS is continuing geological and geophysical studies in the four major western basins to characterize the resource base. Petrographic examination, cross section construction and other studies are continuing in the Uinta and Piceance Basins. El Paso Natural Gas Company has supplied the USGS with additional well data from Pinedale Unit, Wyoming wells, and discussions have been held with Jerry McCutchin Jr. of Dallas on a recent Shannon (Eagle) discovery in South Dakota. The National Laboratories, funded by DOE, are continuing their work in the area of research and development. The emphasis is on the development of new tools and instrumentation systems, rock mechanics, mathematical modeling and data anal-

ysis. Field Tests and demonstrations active in the Uinta and Piceance Basins are: Gas Producing Enterprises (GPE) Natural Buttes Wells No. 14, 18, 19, 20, 21, and 22; Mobil Research and Development, Well No. F-31-13G; and Rio Blanco Natural Gas Company, Well No. 498-4-1. Mitchell Energy Company's proposal to conduct an MHF test in the Cotton Valley limestone gas reservoir in Texas has been approved. Contract negotiations are expected to commence shortly.

POLICY, LEGISLATION, AND REGULATION

44197 Experience gained with the regulation on HP gas pipelines, issued on December 17, 1974. Volk, A. (Mittelrheinische Erdgastransport G.m.b.H. (METG), Haan (Germany, F.R.)); Berkenkamp, K. (Deutscher Verein von Gas- und Wasserfachmaennern e.V. (DVGW), Frankfurt am Main (Germany, F.R.)). *Gas- Wasserfach, Gas-Erdgas;* **118**: No. 11, 503-508(Nov 1977). (In German).

While refering to the three informative meetings and discussions convened by the DVGW since 1975, manufacturers and managers of HP gas pipelines with operating pressures of more than 16 bar are being informed on questions and problems having emerged until now while the regulation has been applied. Corresponding to the specifications of the regulation, statements and definitions on terms and specifications are presented in detail and offer a certain help in decision making and solving questions of interpretation, thus ensuring a practicable, uniform application of the regulation.

PROPERTIES

44198 (PB—276047) A comparison of mathematical models for the prediction of LNG (liquefied natural gas) densities. McCarty, R.D. (National Bureau of Standards, Boulder, Colo. (USA)). Oct 1977. 65p. (NBSIR—77-867).

Four mathematical models of the equation of state for LNG like mixtures are compared. Each model has been optimized to the same experimental data set. The experimental data consist of over 175 new PVTx data points taken in this laboratory. The objective of the study was to obtain a mathematical model which would predict LNG densities to within 0.1% of the true value. The extent to which the objective has been achieved is not clear at this time. Additional experimental data are needed to resolve some discrepancies between the present data and all models investigated to date. Computer program listings for all four models are presented.

OIL SHALES AND TAR SANDS

SITE GEOLOGY AND HYDROLOGY

SITE GEOLOGY

44199 (CIRC—754) Bibliography of the geology of the Green River Formation, Colorado, Utah, and Wyoming, to March 1, 1977. Mullens, M.C. (Geological Survey, Arlington, Va. (USA)). 1977. 55p. Geological Survey, Arlington, VA.

This bibliography, which contains 895 references, was compiled to aid studies on the geology and resources of the Green River Formation. References included are mainly on the areal geology, stratigraphy, paleontology, geochemistry, and mineralogy of the Green River Formation, but some concern development of the oil-shale deposits. Recent studies also concern the effects that an oil-shale industry will have on the environment. The bibliography is arranged in three parts: U.S. Geological Survey reports on the Green River Formation; reports by U.S. Geological Survey authors on geology of the Green River Formation in non-U.S. Geological Survey Publications; and selected reports by non-U.S. Geological Survey authors on the geology of the Green River Formation.

DRILLING, FRACTURING, AND MINING

44200 (LA—6901-PR) Explosively produced fracture of oil shale. Progress report, April—June 1977. Carter, W.J. (comp.). (Los Alamos Scientific Lab., N.Mex. (USA)). Apr 1978. Contract W-7405-ENG-36. 50p. Dep. NTIS, PC A03/MF A01.

Results of a particular interest include extensive development on the hydrodynamics code YAQUI and additional studies of the nonideal explosives ANFO and DBA-1. The code development, essential to the long-term goal of attaining a rock mechanics predictive capability, has been a continuing aspect of the program. The code now permits sophisticated calculations and probably represents the state of the art of hydrodynamic codes tailored for dynamic rock-behavior predictions. The explosive-characterization studies have provided data on low-density ammonium nitrate-6 wt % fuel oil (ANFO), aluminized ANFO, flaked TNT, and the water-gel explosive DBA-1 in aquarium experiments. A new technique using end-on air-shock-wave measurements has corroborated earlier results obtained with the aquarium technique and provides an independent experimental check of the results. A study of joint motion arising from explosions is included because joints are important in determining the fracture pattern resulting from explosive loading. Although part of this study was supported by the Defense Nuclear Agency and calculations are based on energies typically attained only in nuclear explosions, the application to chemical blasting is immediate. A general review of oil shale behavior under dynamic stress is included; some of this material has appeared in previous progress reports, but is repeated here for completeness.

44201 (PB—274435) Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume I. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report. Adams, r.C.; Banks, C.E.; Bradley, W.S.; Brannick, L.L.; Christian, W.G. (Suntech, Inc., Richardson, Tex. (USA)). Jul 1976. Contract S0241046. 432p. NTIS PC A19/MF A01.

This report describes the feasibility of mining the oil shale deposits of the Piceance Creek basin in Colorado by an integrated open pit system. The study is based upon a comprehensive analysis of pertinent environmental, economic, and engineering factors. Ten mining cases are investigated, and the mine design and cost estimates for each case are presented in this report. Nine of the cases represent three cutoff grades, defining oil shale ore as equal to and above 15 gallons per ton (gpt), 20 gpt, and 25 gpt, at three ore production levels of 500,000 tons per day (TPD), 1,250,000 TPD, and 2,500,000 TPD. The tenth case is an alternate design of the 500,000 TPD production rate at the above 15 gpt cutoff grade. The report consists of Volume I, a technical and cost comparison of the ten cases; Volume II-Part 1, a detailed explanation of the estimating methods used; and Volume II-Part 2, a more detailed discussion of the technical and cost features of the ten cases than is presented in Volume I.

44202 (PB—274520) Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume II, Parts 1 and 2. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report. Adams, R.C.; Banks, C.E.; Bradley, W.S.; Brannick, L.L.; Christian, W.G. (Suntech, Inc., Richardson, Tex. (USA)). Jul 1976. Contract S0241046. 1031p. NTIS PC E14/MF A01.

This report describes the feasibility of mining the oil shale deposits of the Piceance Creek basin in Colorado by an integrated open pit system. The study is based upon a comprehensive analysis of pertinent environmental, economic, and engineering factors. Ten mining cases are investigated, and the mine design and cost estimates for each case are presented in this report. Nine of the cases represent three cutoff grades, defining oil shale ore as equal to and above 15 gallons per ton (gpt), 20 gpt, and 25 gpt, at three ore production levels of 500,000 tons per day (TPD), 1,250,000 TPD, and 2,500,000 TPD. The tenth case is an alternate design of the 500,000 TPD production rate at the above 15 gpt cutoff grade. The report consists of Volume I, a technical and cost comparison of the ten cases; Volume II-Part 1, a detailed explanation of the estimating methods used; and Volume II-Part 2, a more detailed discussion of the technical and cost features of the ten cases than is presented in Volume I.

OIL PRODUCTION, RECOVERY, AND REFINING

IN SITU METHODS, TRUE AND MODIFIED

44203 (FE—2346-20) Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October—December 1977. Humphrey, J.P. (Dow Chemical Co., Midland, Mich. (USA). Hydrocarbons and Energy Research Dept.). 18 Jan 1978. Contract EX-76-C-01-2346. 47p. (DOW/SRPR—20). Dep. NTIS, PC A03/MF A01.

In situ combustion was initiated in Dow/Rhoburn Well No. 4 in mid-November with the recently modified electric heater. One leg of the heater shorted out during the second day, but heating was continued at a reduced level for eleven days until the heater failed. The analysis of production gases indicates that combustion was achieved and sustained for several days, but conditions for maintaining combustion over an extended period were not achieved. Dow/ERDA Wells No. 101 and 102 were hydraulically fractured and sand propped. Later, logging showed enlarged and new vertical fractures. Dow/ERDA Well No. 103, the first of four planned

observation and test wells, was drilled near Well No. 102. These new wells will be used in the evaluation of the fracturing around No. 102 and possibly in further hydrofracturing experiments. Preparation for explosive fracturing of the formation is underway. Shale characterization and resource inventory activities are continuing in four of the major universities of Michigan.

44204 (TID—28053/1) **Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976—October 31, 1977. Volume I.** Loucks, R.A. (Occidental Oil Shale, Inc., Grand Junction, Colo. (USA)). Nov 1977. Contract EF-77-A-043873. 233p. Dep. NTIS, PC A11/MF A01.

Since early 1973, Occidental Oil Shale, Inc. (OXY) has processed three small-scale modified in situ retorts (Retorts 1E, 2E, and 3E) in their Research Mine, and is currently processing the second large-sized retort (Retort 5) in their Development Mine, both mines being located on OXY's D.A. Shale property northeast of DeBeque, Colorado. Progress of the project since November 1, 1976 is summarized starting with the pre-blast activities and the startup for Retort 5, through the mining progress in the formation of Retort 6. The environmental aspects including the required permits are discussed along with the geology and hydrology data from the C-b tract. Results of various studies on potential markets for shale oil are presented and the schedules presented in OXY's proposal to ERDA are compared with the schedules achieved through October, 1977. A section is included on future plans. (JRD)

44205 (TID—28053/2) **Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976—October 31, 1977. Volume II.** Loucks, R.A. (Occidental Oil Shale, Inc., Grand Junction, Colo. (USA)). Nov 1977. Contract EF-77-A-04-3873. 42p. Dep. NTIS, PC A18/MF A01.

A listing of the plant species (the flora) and an assessment of their relative amounts in various areas (the vegetation) have been compiled for the Occidental Oil Shale, Inc. property near DeBeque, Colorado. One hundred eighty-four species of higher plants have been found on the property. These include 7 trees, 25 shrubs, 16 grasses, 134 forbs, and 2 succulents. Ninety-one percent of these species are native to the area. Ten types of vegetation were identified following collection and statistical analysis of cover, density, and frequency data from systematically arranged plots. The importance of these types, the soils and landforms associated with them, and major estimates of response to development are discussed by vegetation type. The use of each of these types by livestock and game animals has also been indexed. Of particular importance to science and oil shale development is the occurrence of two species (Astragalus lutosus and Festuca dasyclada) on the Smithsonian's rare and endangered species list. The grass (Festuca) occurs at one known site on the Mahogany Ledge at a location far away from present or planned surface disturbances. It was thought to have been extinct. The locoweed (Astragalus) is previously known from Rio Blanco County and is also present on other oil shale properties. It is urged that care be taken in constructing roads and muck dumps so that brushy vegetation is not smothered; it is needed to hold soil in place and thereby prevent excessive land slumping and erosion.

SURFACE METHODS

44206 Process for obtaining oil, gas, sulfur, and other products from oil shale. Da Costa Barcellos, E. US Patent 4,060,479. 29 Nov 1977. Priority date 21 Oct 1974, Brazil. 14p.

A process is described for obtaining oil, gas, sulfur, and other products from shale whereby there is effected drying, pyrolysis, gasification, combustion, and cooling of pyrobituminous shale or similar rocks in a single passage of the shale continuously in a moving bed. The charge and discharge of the shale is intermittent. The maximum temperature of the bed is maintained in the range of about 1050 to 1200°C or higher. The shale is essentially completely freed from the organic matter, fixed carbon and sulfur, resulting in a clean solid residue which can be disposed of without harming the ecology.

REFINING

REFER ALSO TO CITATION(S) 44065

44207 (BERC/IC—77/3) **Refining of shale oil.** Lanning, W.C. (Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center). May 1978. 22p. Dep. NTIS, PC A02/MF A01.

The refining of shale oil is reviewed to assess the current state-of-the-art, especially as to the avaiability of technology suitable for operation on a commercial scale. Oil shale retorting processes as they affect the quality of the crude shale oil for refining, exploratory research on the character and refining of shale oil, and other published refining background leading to the present status are discussed. The initial refining of shale oil requires the removal of a large concentration of nitrogen, an added step not required for typical petroleum crude oils, and recently published estimates show that the total cost of refining will be high. Specific technoloy is reported by industry to be technically proven and available for commercial-scale refining. Although the refining will be more costly than that of petroleum, the viability of a shale oil industry will also be affected greatly by the technology and costs of producing the crude shale oil, environmental costs, and future price and tax treatment, and these are outside the scope of this study of refining.

44208 (FE—2315-22) **Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, October—December 1977.** Sullivan, R.F.; Green, D.C.; Chen, H.C. (Chevron Research Co., Richmond, Calif. (USA)). Jan 1978. Contract EX-76-C-01-2315. 62p. Dep. NTIS, PC A04/MF A01.

Pilot plant studies have now been completed for the processing of Paraho shale oil. Three processing routes are being evaluated: (1) whole shale oil hydrotreating followed by fluid catalytic cracking (FCC) as the major downstream processing step, (2) whole shale oil hydrotreating followed by hydrocracking as the major processing step, (3) coking of the shale oil followed by hydrotreating of the coker distillate as the major downstream processing step. Pilot plant studies show that all three routes are technically feasible. Analyses of the results and process design studies are being completed. The relative merits and economics of each route will be discussed in the final report. SRC is difficult to process compared to most petroleum feeds and to shale oil. Because of its high melting point, it is necessary to dissolve it in an appropriate solvent before it can be hydrotreated in existing fixed bed pilot plant equipment. The first solvent for SRC in these tests was creosote oil; a 50/50 blend was tested. In the first test, ICR 106 catalyst showed little fouling in 330 hours. About half of the 850°F + SRC was converted to 850°F - distillate; and the nitrogen content was reduced from 1.5% in the SRC/creosote oil blend to 0.2—0.3% in the product. However, after 330 hours on stream, plugging occurred in the catalyst bed. In a second run, 100 hours of operation were achieved without plugging. However, the catalyst deactivation rate was relatively high. Another solvent being tested is the 350—850°F product from the SRC/creosote oil hydroprocessing runs. Plugging problems were again encountered using this solvent.

PROPERTIES AND COMPOSITION

REFER ALSO TO CITATION(S) 44203

44209 Stable carbon isotope ratios and chemical properties of kerogen and extractable organic matter in prephanerozoic and phanerozoic sediments: their interrelations and possible paleobiological significance. Jackson, T.A. (Freshwater Inst., Winnipeg, Manitoba); Fritz, P.; Drimmie, R. *Chem. Geol.;* **21**: No. 3-4, 335-350(Feb 1978).

Kerogen and the polar (or "humic") fraction of benzene/methanol extractable organic matter in various pre-Phanerozoic and Phanerozoic sedimentary rocks were analyzed for stable C isotope content. Variations in the delta ^{13}C values as functions of the geologic age and chemical properties of the organic substances were investigated. The delta ^{13}C values of both kerogen and extractable polar organic matter in mudstones showed a tendency to decrease with increasing geologic age. The delta ^{13}C values of all kerogen samples showed a highly significant negative correlation with the ratio of aliphatic to condensed aromatic components of their respective polar extracts, and delta ^{13}C of kerogen in carbonate rocks and cherts showed a significant positive correlation with the aromaticity of the kerogen. These results demonstrate that the aliphatic components of organic matter are isotopically lighter than the associated aromatic components, suggesting that the aliphatic chains are derived from lipids of algae. Delta ^{13}C of kerogen in carbonate rocks and most cherts showed significant negative correlation with concentration of OH groups in polar extracts, suggesting loss of phenolic OH groups with increase in condensed-aromatic character. Comparisons between delta ^{13}C values of kerogen and polar extracts from mudstones are tentatively interpreted as indicating that terrigenous organic matter, and hence land life, originated between 1.05×10^9 and 1.3×10^9 years ago as a manifestation of the early evolution of eucaryotic algae.

ENVIROMENTAL ASPECTS

REFER ALSO TO CITATION(S) 44090, 44204, 44205

NUCLEAR FUELS

RESERVES

44210 (LA-tr—78-26) **Geological follow-up of the mining of the natural reactors of Oklo.** Gauthier-Lafaye, F. (Strasbourg-1 Univ., - 67 (France). Geology Inst.). 1978. Translation of IAEA-TC—119/3. (CONF-771222—8). 35p. Dep. NTIS, PC A03/MF A01.

From IAEA symposium on natural fission reactors; Paris, France (19 Dec 1977).

The portion of the natural reactors of Oklo which was in place after their discovery was mined between September 1975 and February 1977. In the reaction zones, 27 rock faces, and 8 outcrops were surveyed in detail and sampled; about 1700 samples were taken. These surveys were the occasion for numerous sedimentological, petrographic and tectonic observations.

44211 **Mechanism of layer-infiltration ore deposition.** Shmariovich, E.M. *J. Geophys. Res.;* **19**: No. 2, 137-144(Feb 1977).

Translated from Sov. Geol.; No. 2, 80-89(1976).

Chemical thermodynamic data and mineralogical-geochemical observations help to define the conditions of precipitation of uranium and its satellites from infiltration waters in the thinning-out area of zones of layered limonitization. Localization of mineralization, morphology of the ore segregations, and mineral composition of the ores are dependent on the grade of uranium content of the oxygenated formation solutions and their amounts of carbonate ion. It has been shown that ore bodies wih narrow "saccate" particles, sometimes disintegrating into a series of lensoid segregations and often consisting of finely dispersed coffinite, develop where the ore-forming waters have low concentrations of dissolved uranium—less than $5 \cdot 10^{-5}$ g/liter (with $\Sigma a/sub\ CO/$ on the order of 10^{-2} g/kg of H_2O). The scheme of infiltration ore formation in thermodynamic respects is of little use in explaining the origin of the black-pitchblende ores superimposed on the limonitized rocks.

EXPLORATION

44212 (GJBX—51(78)) **Geology of the Raleigh 1° x 2° Quadrangle, North Carolina.** Wilson, W.F.; Carpenter, P.A. III; Burt, E.R.; McDaniel, R.D.; Coffey, J.C.; McKensie, B.J. (North Carolina Dept. of Natural Resources and Community Development, Raleigh (USA). Div. of Earth Resources; Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.). Mar 1978. Contract EY-76-C-09-0001. 184p. (DP—1490). Dep. NTIS, PC A08/MF A01.

This document is a facsimile edition (with accompanying maps) of a report "Geology of the Raleigh Two-Degree Sheet, North Carolina, with Locations of Selected Mineral Occurrences" prepared for the Savannah River Laboratory by the Geology and Mineral Resources Section of the North Carolina Department of Natural Resources and Community Development, Raleigh, North Carolina, under contract to SRL. This report is primarily a compilation of work completed and published since the publication of the 1958 geologic map of the State of North Carolina. The purpose of the report is to provide background geologic information to aid in the interpretation of NURE geochemical reconnaissance data. There are 122 pages of text including detailed descriptions of economic mineral localities as well as a mineral locality map and a geologic map. This report is being issued separately in order to disseminate its content to potential users on a timely basis. An abbreviated version of this report and a slightly modified geologic map will be issued as part of SRL's report on results of NURE reconnaissance sampling in the Raleigh 1° x 2° quadrangle. The latter release is tentatively scheduled for late 1979.

44213 (IS—4370) **Multilaboratory analytical quality control for the hydrochemical and stream sediment reconnaissance.** D'Silva, A.P.; Haas, W.J. Jr.; Floyd, M.A. (Ames Lab., Iowa (USA)). Mar 1978. Contract W-7405-ENG-82. 40p. Dep. NTIS, PC A03/MF A01.

The reconnaissance is part of the National Uranium Resource Evaluating (NURE) program. The quality assurance program is essential to ensure that reliable analytical measurements are obtained by the four ERDA laboratories. (DLC)

44214 (K/UR—12) **Procedures manual for groundwater reconnaissance sampling.** (Union Carbide Corp., Oak Ridge, Tenn. (USA). Nuclear Div.; Oak Ridge Gaseous Diffusion Plant, Tenn. (USA)). 31 Mar 1978. Contract W-7405-ENG-26. 51p. (GJBX—62-78). Dep. NTIS, PC A04/MF A01.

The National Uranium Resource Evaluation (NURE) Program was established in 1973. The NURE Program consists of five parts: (1) hydrogeochemical and stream sediment reconnaissance survey, (2) aerial radiometric survey, (3) surface geologic investigations, (4) drilling for geologic information, and (5) geophysical technology development. Data from all five phases of the NURE Program will be combined within the 1° x 2° National Topographic Map Service (NTMS) quadrangle boundaries and will form the basis on which uranium reserve calculations will be made. This manual covers field operations, site selection, well water sample collection and field measurement, well water sample data recording, evaluation of contamination, and guidelines for data control.

44215 (LA—7180-MS) **Uranium hydrogeochemical and stream sediment reconnaissance data release for the New Mexico portions of the Douglas, Silver City, Clifton, and Saint Johns NTMS quadrangles, New Mexico/Arizona.** Sharp, R.R. Jr.; Morris, W.A.; Aamodt, P.L. (Los Alamos Scientific Lab., N.Mex. (USA)). Mar 1978. Contract W-7405-ENG-36. 244p. (GJBX—69(78)). Dep. NTIS, PC A11/MF A01.

This report describes work done in the Douglas, Silver City, Clifton, and Saint Johns, New Mexico/Arizona, National Topographic Map Series (NTMS) quadrangles (1:250,000 scale) by the Los Alamos Scientific Laboratory (LASL) as part of the nationwide Hydrogeochemical and Stream Sediment Reconnaissance (HSSR). The HSSR is designed to identify areas having higher-than-normal concentrations of uranium in ground waters, surface waters, and water-transported sediments. In 1976 three private contractors, under contract to the LASL, collected water and stream sediment samples in New Mexico from the Mexico border north to Interstate 40 (north of 35°N latitude) and from 107°30′ W longitude west to the New Mexico/Arizona state line. This report presents only the data from these sampling programs for the locations west of 108°W longitude—the New Mexico portions of the Douglas, Silver City, Clifton, and Saint Johns NTMS quadrangles. The numbers of water samples and sediment samples, respectively, collected in each quadrangle were: Douglas, 181 and 237; Silver City, 474 and 755; Clifton, 469 and 913; and Saint Johns, 437 and 672. The standard field and analytical procedures used in this uranium reconnaissance are given in Appendix A. Listings of the field and uranium data for the water samples from the New Mexico portions of the four NTMS quadrangles are given in Appendixes B-I through B-IV. Listings of the field and uranium data for the sediment samples are given in Appendixes C-I through C-IV. Keys to the water and sediment sample types as well as codes to site data are given in Appendix D.

44216 (LA—7296-PR) **Geostatistics Project of the National Uranium Resource Evaluation Program. Progress report, January—March 1978.** Bement, T.R.; Campbell, K.; Wecksung, G.; McKay, M.D.; Zeigler, R.K. (Los Alamos Scientific Lab., N.Mex. (USA)). May 1978. Contract W-7405-ENG-36. 4p. (GJBX—72(78)). Dep. NTIS, PC A02/MF A01.

Multivariate analysis procedures have been applied to data from the Lubbock quadrangle and the results displayed using pseudocolor mapping procedures. Data from the Plainview quadrangle have been established in a data base and similar procedures will be applied there. A computer code for simulating the acquisition and reduction of aerial radiometric data was obtained from Bendix Field Engineering Corporation and is now running at LASL. The use of adaptive and robust procedures to characterize families of distributions is continuing.

44217 (USGS-CIRC—753) **Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.** Campbell, J.A. (ed.). (Colorado School of Mines, Golden (USA)). 1977. 82p. (CONF-770480—(Absts.)). U.S. Geological Survey, Arlington, VA.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

44218 (USGS-CIRC—753, pp 35-38) **Geology of uraniferous tertiary rocks in the Artillery Peak-Date Creek basin, west-central Arizona.** Otton, J.K. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44219 (USGS-CIRC—753, pp 37-38) **Uranium associated with iron—titanium oxide minerals and their alteration products in a south Texas roll-type deposit.** Reynolds, R.L.; Goldhaber, M.B.; Grauch, R.I. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44220 (USGS-CIRC—753, pp 39-40) **Uranium—lead apparent ages of uraniferous secondary silica as a guide for describing uranium mobility.** Zielinski, R.A.; Ludwig, K.R.; Lindsey, D.A. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44221 (USGS-CIRC—753, pp 43-44) **Distribution of uranium in sediment samples as determined by multi-element analysis.** Tewhey, J.D. (Univ. of California, Livermore). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44222 (USGS-CIRC—753, pp 45-47) **Uranium deposits related to depositional environments in the Morrison Formation (upper jurassic), Henry Mountains mineral belt of southern Utah.** Peterson, F. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44223 (USGS-CIRC—753, pp 48-50) **Determination of uranium in source rocks using radium in Crystal Springs, Great Salt Lake area, Utah.** Felmlee, J.K.; Cadigan, R.A. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44224 (USGS-CIRC—753, pp 50-51) **Thinning of the Fox Hills sandstone, Crook County, Wyoming: a possible guide to uranium mineralization.** Dodge, H.W. Jr.; Spencer, C.W. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44225 (USGS-CIRC—753, pp 52-53) **Uranium exploration using helium detection: a case study.** Reimer, G.M. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44226 (USGS-CIRC—753, pp 53-55) **Geochemical interpretation of ore zonation at the Rifle vanadium mine, Colorado.** LaPoint, D.J.; Markos, G. (Univ. of Colorado, Boulder). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44227 (USGS-CIRC—753, pp 56-57) **Assay for uranium and measurement of disequilibrium by means of high-resolution gamma-ray borehole sondes.** Tanner, A.B.; Moxham, R.M.; Senftle, F.E. (Geological Survey, Reston, VA). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44228 (USGS-CIRC—753, pp 57-60) **Refinement of the thermodynamic properties of uranium minerals and dissolved species, with application to the chemistry of ground waters in sandstone-type uranium deposits.** Langmuir, D.; Applin, K. (Pennsylvania State Univ., University Park). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44229 (USGS-CIRC—753, pp 61-62) **Uranium potential of sedimentary and igneous rocks in western and southwestern Oklahoma.** Al-Shaieb; Zuhair; Shelton, J.W. (Oklahoma State Univ., Stillwater). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44230 (USGS-CIRC—753, pp 63-64) **New and recent results from the Canadian uranium reconnaissance program.** Darnley, A.G. (Geological Survey of Canada, Ottawa). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44231 (USGS-CIRC—753, pp 65-66) **Interpretation of uranium content of ground water in west-central Kansas.** Hathaway, L.R. (Kansas Geological Survey, Lawrence). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44232 (USGS-CIRC—753, pp 66-68) **Geochemical prospecting at the Ladwig uranium mine, near Golden, Colorado.** Ferris, C.S.; Bennett, N. 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44233 (USGS-CIRC—753, pp 68-70) **Hydrogeochemistry of uranium in the Walker River Basin, California and Nevada.** Leach, D.L.; Benson, L.V. (Univ. of California, Livermore). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44234 (USGS-CIRC—753, pp 70-72) **Uranium and thorium distribution in continental tertiary rocks of the Cook Inlet Basin and some adjacent areas, Alaska.** Dickinson, K.A. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44235 (USGS-CIRC—753, pp 72-73) **^{252}Cf-based borehole logging system for in-situ assaying of uranium ore.** Steinman, D.K.; Costello, D.G.; Pepper, C.S.; Gober, W.E.; Breuner, D.B.; Wilson, J.S.M.; Young, J.C.; John, J. (IRT Corp., San Diego, CA). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44236 (USGS-CIRC—753, pp 73-74) **Anomalous uranium in the waters of the Rio Ojo Caliente, New Mexico.** Wenrich-Verbeek, K.J. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44237 (USGS-CIRC—753, pp 1-4) **Geologic foundation for uranium resource assessment, Triassic Chinle Formation, Southeast Utah.** Lupe, R. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44238 (USGS-CIRC—753, pp 5-6) **Surface geophysical methods applied to uranium exploration in crystalline terranes.** Flanigan, V.J. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44239 (USGS-CIRC—753, pp 8-10) **Theory for the origin of the Rifle-Garfield vanadium—uranium deposit.** Spirakis, C.S. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44240 (USGS-CIRC—753, pp 10-11) **New structural model for humic material which shows sites for attachment of oxidized uranium species.** Jennings, J.K.; Leventhal, J.S. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44241 (USGS-CIRC—753, pp 12-13) **Non-linear complex resistivity for the characterization of sedimentary uranium deposits.** Olhoeft, G.R. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44242 (USGS-CIRC—753, pp 13-15) **Total-field magnetic surveying as an exploration tool for sedimentary uranium deposits.** O'Connor, L.J.; Smith, B.D. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44243 (USGS-CIRC—753, pp 15-17) **Origin of uranium in the middle Precambrian Estes Conglomerate, Eastern Black Hills, South Dakota: inferences from lead isotopes.** Hills, F.A.; Delevaux, M.H. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44244 (USGS-CIRC—753, pp 17-19) **Role of borehole electrical measurements in uranium exploration.** Daniels, J.; Scott, J. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44245 (USGS-CIRC—753, pp 19-20) **How to plan an aerial gamma-ray survey.** Pitkin, J.B.; Duval, J.S. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44246 (USGS-CIRC—753, pp 23-24) **Two-mica granite and uranium potential in the northern Appalachian orogen of New England.** Boudette, E.L. (Geological Survey, Reston, VA). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44247 (USGS-CIRC—753, pp 27-29) **Computer-enhanced images and geologic studies, southern Powder River Basin, Wyoming.** Offield, T.W.; Raines, G.L.; Sawatzky, D.L. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44248 (USGS-CIRC—753, pp 29-31) **Characterization of fine-grained black uranium ores by transmission electron microscopy.** Nord, D.L. Jr. (Geological Survey, Reston, VA). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44249 (USGS-CIRC—753, pp 32) **Examples of uranium distribution graphics in geologic rock specimens illustrated with the Radioluxograph, induced fission tracks, and other tracks methods.** Dooley, J.R. Jr.; Conwell, C.N.; Berendsen, P.; Otton, J.K.; Pierson, C.T.; Hoisington, W.D.; Lindsey, D.A.; Rosholt, J.N. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44250 (USGS-CIRC—753, pp 33-34) **Speculation on three possible modes of emplacement of uranium into deposits of the Midnite Mine, Stevens County, Washington.** Nash, J.T. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44251 (USGS-CIRC—753, pp 34) **Conceptual—mathematical models of uranium ore formation in sandstone-type deposits.** Leventhal, J.S.; Granger, H.C. (Geological Survey, Denver). 1977.

From Uranium-thorium symposium; Golden, CO, USA (27 Apr 1977).

In Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977.

44252 **Uranium prospecting in the Federal Republic of Germany.** Barthel, F. (Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover (Germany, F.R.)). *Naturwissenschaften;* **64**: No. 10, 499-506(Oct 1977). (In German).

Two deposits that can be considered economically minable have been found during the last twenty years of prospecting for uranium in the Federal Republic of Germany. These deposits, Menzenschwand and Muellenbach, are situated in the northern and southern Black Forest, respectively. In addition, favorable indications have been found in Paleozoic granites of north eastern Bavaria, of the Black Forest, and Odenwald, as well as in Permian and Triassic sediments of Rhineland-Palatinate, Franconia, and Wuerttemberg. The uranium resources that can be expected from all these deposits are insufficient to meet the domestic demand.

MINING

44253 (NTIS/PS—78/0048) **Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964—1977.** Smith, M.F. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 130p.

Pollution, public and occupational health, and waste management associated with uranium ore recovery and processing are cited. The monitoring and control of contamination in air and effluents in the mining vicinities are discussed. Site surveys, radioactivity, and the nuclear fuel cycle are covered in this collection of Federally-funded research. (Contains 125 abstracts)

44254 (NTIS/PS—78/0049) **Uranium mining and milling environmental studies (citations from the Engineering Index data base). Report for 1970—1977.** Smith, M.F. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 78p.

Worldwide research is cited on uranium mining waste management and effluent control. Studies on mining practices, radon monitoring, health hazards, and land reclamation are covered. Government policies and regulations concerning present and long term waste handling are included. The nuclear fuel cycle from mining through spent fuel reprocessing is also discussed. (Contains 71 abstracts)

44255 **Review of nuclear techniques for process control in the gold and uranium mining industries.** De Jesus, A.S.M.; Basson, J.K. (Atomic Energy Board, Pelindaba, Pretoria (South Africa). Isotopes and Radiation Div.). *Int. J. Appl. Radiat. Isot.;* **28**: No. 10, 873-883(1977).

Present nuclear techniques used in process control during the recovery of gold and uranium are reviewed. Some comments are made on the advantages and limitations of the techniques and an indication is given of expected future advances and trends.

FEED PROCESSING

REFER ALSO TO CITATION(S) 44253, 44254

44256 Symposium 'geology, mining and extractive processing of uranium, with special reference to Europe'. Pietsch, H.B. (Lurgi Chemie und Huettentechnik G.m.b.H., Frankfurt am Main (Germany, F.R.)). *Erzmetall;* **30**: No. 4, 171-173(1977). (In German).

From International Symposium on Geology, Mining and Extractive Processing of Uranium with Special Reference to Europe; London, UK (17 - 19 Jan 1977).

This review of the symposium 'Geology, mining and extractive processing of uranium' gives a survey from the point of view of ore processing rather than exploration. A reason for the uranium consumption assumed is given, and uranium deposits and availability, methods of exploration, and interesting facts on uranium extraction from ores are gone into.

ENRICHMENT

44257 Physics of uranium-235-enrichment in the separation nozzle process. IV. Separation nozzle with double flow deflection and triple stream splitting. Becker, E.W.; Bier, W.; Bley, P.; Ehrfeld, U.; Ehrfeld, W.; Eisenbeiss, G.; Rosenbaum, F.J.; Schmid, E. (Karlsruhe Univ. (TH) (Germany, F.R.). Inst. fuer Kernverfahrenstechnik; Kernforschungszentrum Karlsruhe (Germany, F.R.). Inst. fuer Kernverfahrenstechnik). *Z. Naturforsch., a;* **32**: No. 5, 401-410(May 1977). (In German).

In the separation nozzle process for enrichment of U-235 the kinetic energy of the jet is concentrated in the heavy fraction of the H_2/UF_6 mixture. Flow measurements with free molecular probes and separation experiments have shown that this energy can be utilized in a so-called double deflection nozzle to increase significantly the overall isotope separation effect.

GASEOUS DIFFUSION

REFER ALSO TO CITATION(S) 44308

LASER EXCITATION

44258 Apparatus for extraction and separation of a preferentially photo-dissociated molecular isotope into positive and negative ions by means of an electric field. Fletcher, J.C. US Patent 4,085,332. 18 Apr 1978. Filed date 3 Jun 1976. 6p.

Apparatus for the separation and extraction of molecular isotopes is claimed. Molecules of one and the same isotope are preferentially photo-dissociated by a laser and an ultraviolet source, or by multi-photon absorption of laser radiation. The resultant ions are confined with a magnetic field, moved in opposite directions by an electric field, extracted from the photo-dissociation region by means of screening and accelerating grids, and collected in ducts.

FUELS PRODUCTION AND PROPERTIES

44259 (CONF-780535—1) **Progress on sol-gel sphere-pac development.** Suchomel, R.R. (Oak Ridge National Lab., Tenn. (USA)). 1978. Contract W-7405-ENG-26. 21p. Dep. NTIS, PC A02/MF A01.

From Meeting on fuel element development programs; Richland, WA, USA (2 May 1978).

The ORNL sol-gel program is reviewed briefly. Advantages of the sol-gel sphere-pac are listed. Three sizes of microspheres are being used; the two largest sized fractions are blended and then loaded into the fuel rod, followed by packing of the smallest microspheres into void spaces using a low-energy vibrator. Sol-gel sphere-pac also appears attractive for breeder reactor fuel fabrication. (DLC)

44260 (HEDL-SA—1409) **Automatic surface flaw inspection of nuclear fuel pellets.** McLemore, D.R.; Nyman, D.H.; Wilks, R.S. (Hanford Engineering Development Lab., Richland, Wash. (USA); Westinghouse Electric Corp., Churchillboro, Pa. (USA). Mechanical Research and Development Div.). 1978. Contract EY-76-C-14-2170. 7p. (CONF-780324—6). Dep. NTIS, PC A02/MF A01.

From SPIE '78 seminars; Washington, DC, USA (28 Mar 1978).

The Hanford Engineering Development Laboratory (HEDL), operated by the Westinghouse Hanford Company, is developing automated equipment for fabrication and inspection of nuclear reactor fuels. One inspection process that has been evaluated is automatic surface flaw inspection of nuclear fuel pellets. The inspection technique involves projecting a well-defined spot of light onto the surface of a rotating pellet and collecting the light specularly reflected from the pellet's surface. The data form a binary description of the surface topography, which is then processed to identify and quantify flaw attributes before accept/reject decisions are made. The inspection apparatus is designed to operate at a rate of three pellets per second. A unique flaw interpretation algorithm is used to evaluate surface acceptability. The size and shape of a flaw is characterized by its area and by its area-to-perimeter ratio.

44261 (ORNL/TM—6321) **Design study for a 24-cm HTGR microsphere coating furnace.** Suchomel, R.R.; Braatz, R.J.; Bolfing, B.J.; Heck, J.L. (Oak Ridge National Lab., Tenn. (USA)). May 1978. Contract W-7405-ENG-26. 34p. Dep. NTIS, PC A03/MF A01.

This report describes the conceptual design of a prototypic furnace for use in the fabrication of High-Temperature Gas-Cooled Reactor fuel. The design is of a system capable of coating fuel particles in a remote hot-cell operation. The coater will be used to confirm equipment design for a commercial fuel refabrication facility. The coating system includes the furnace, batch unloading equipment, batch weighing and sampling equipment, effluent treatment equipment, and system support equipment.

44262 Single carrier method for the emission spectrometric analysis of uranium-plutonium oxides. Ko, R. (Hanford Engineering Development Laboratory, Richland, Washington 99352). *Appl. Spectrosc.;* **32**: No. 3, 325-326(May 1978).

The advantages of a single carrier method of impurities analysis of Pu-U mixed oxide fuels are discussed. SrF_2 and Ga_2O_3 were used as carriers.

44263 Nondestructive determination of nuclear fuel enrichment by Ge(Li) spectrometer. Skrivankova, M. (Ustav Jaderneho Vyzkumu, Rez (Czechoslovakia)). *Jad. Energ.;* **22**: No. 12, 441-443(Dec 1976). (In Czech).

A non-destructive method is described of the determination of the enrichment of uranium with ^{235}U within the region of 0.7 to 90% by means of a comparison of the spectra of ^{235}U and sup(234m)Pa. The gamma spectrum of these isotopes was scanned with a coaxial Ge(Li) detector with a volume of 77 cm^3. The time of measurement was between 1 to 2 hrs; the statistical error for the 1001.4 keV line was in all cases less than 1.5%. The described method allows for the measurement of uranium samples with arbitrary enrichment and various chemical composition and geometry without necessitating comparison with the standard.

SPENT FUELS REPROCESSING

REFER ALSO TO CITATION(S) 44294, 44295, 44766

44264 (AECL—4436/2) **Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 3: reprocessed fuel: plutonium product, and high level waste.** Clegg, L.J.; Coady, J.R. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jan 1977. 326p. Dep. NTIS (US Sales Only), PC A15/MF A01.

The two books of Volume 1 comprise the first in a three-volume series of compilations on the radioactive decay propertis of CANDU fuel and deal with the natural uranium fuel cycle. Succeeding volumes will deal with fuel cycles based on plutonium recycle and thorium. In Volume 1 which is divided into three parts, the computer code CANIGEN was used to obtain the mass, activity, decay heat and toxicity of CANDU fuel and its component isotopes. Data are also presented on gamma spectra and neutron emissions. Part 3 contains the data relating to the plutonium product and the high level wastes produced during fuel reprocessing.

44265 (AIAU—77503) **Apparatuses for the dissolution of resistent nuclear fuel for analytical sample preparation.** Bobleter, O.; Forster, H.P. (Atominstitut der Oesterreichischen Hochschulen, Vienna). Jul 1977. 6p. (In German). Dep. NTIS (US Sales Only), PC A02/MF A01.

Two apparatuses are described, by means of which resistent nuclear fuel can be dissolved automatically. The first of these is designed to oxidize carbon coated nuclear fuel microspheres. Afterwards the oxidation residue is dissolved in acid. With the second apparatus direct dissolution procedures, such as the dissolution of uranium zirconium hydride samples with a mixture of ammonium fluoride and nitric acid, can be carried out. The dissolution process can be controlled with a Geiger Mueller counter. These apparatuses are especially useful in the preparation of samples for qualitative and quantitative analyses.

44266 (BNWL-tr—319) **Process for the conditioning of irradiated nuclear fuel.** May 1978. Translated from Netherlands Patent 7,500,663. 21p. Dep. NTIS, PC A02/MF A01.

A process is claimed for the conditioning of nuclear fuel containing plutonium and uranium oxides. In order to draw off the uranium oxides, the nuclear fuel is put into a sodium nitrate bath at a temperature of 400—500°C. The gaseous phase which is formed is removed, and the solid phase is separated from the liquid phase. (LK)

44267 One hundred days at Windscale. Smith, P.J. (Open Univ., Milton Keynes (UK)). *New Soc. (London);* **42**: No. 790, 405-407(24 Nov 1977).

An account is given of the inquiry into the application by British Nuclear Fuels Limited for permission to establish a plant for reprocessing irradiated oxide nuclear fuels and support site services at Windscale Works. The subject matter of the proposal is summarized, and the quantities of material involved are discussed in relation to the various forecasts of UK energy requirements. The objections made at the inquiry are outlined: these covered economic, security, political and health aspects. Possible outcomes of the inquiry are considered.

44268 Quarterly statement on incidents at nuclear installations, third quarter 1977. *Helv. Chim. Acta;* No. 74, vp(2 Nov 1977).

United Kingdom government regulations require licensees of nuclear installations to report immediately certain types of incident that may result in the release of radioactivity. The present statement includes all incidents reported in the period 1 July 1977 to 30 September 1977. U.K.).

44269 Quarterly statement on incidents at nuclear installations, second quarter 1977. *Helv. Chim. Acta;* No. 34, 1-7(31 Aug 1977).

United Kingdom government regulations require licensees of nuclear installations to report immediately certain types of incident that may result in the release of radioactivity. The present statement includes all incidents reported in the period 1 April 1977 to 30 June 1977.

44270 Quarterly statement on incidents at nuclear installations. *Helv. Chim. Acta;* No. 15, 1-10(26 May 1977).

United Kingdom government regulations require licensees of nuclear installations to report immediately certain types of incident that may result in the release of radioactivity. The present statement includes all incidents reported in the period 9 Decemeber 1976 to 31 March 1977.

44271 Windscale. A summary of the evidence and the argument. London; Guardian Newspaper (1977). 107p.

A summary is presented of the day-by-day evidence and argument at the public inquiry into British Nuclear Fuel's application to build a thermal oxide processing plant and support services at Windscale.

TRANSPORT AND STORAGE

44272 (CONF-780506—9) **Analysis of alternative transportation methods for radioactive materials shipments including the use of special trains for spent fuel and wastes.** Smith, D.R.; Luna, R.E.; Taylor, J.M. (Sandia Labs., Albuquerque, N.Mex. (USA)). 1978. Contract EY-76-C-04-0789. 17p. Dep. NTIS, PC A02/MF A01.

From 5. symposium on packaging and transportation of radioactive materials; Las Vegas, NV, USA (7 May 1978).

Two studies were completed which evaluate the environmental impact of radioactive material transport. The first was a generic study which evaluated all radioactive materials and all transportation modes; the second addressed spent fuel and fuel-cycle wastes shipped by truck, rail and barge. A portion of each of those studies dealing with the change in impact resulting from alternative shipping methods is presented in this paper. Alternatives evaluated in each study were mode shifts, operational constraints, and, in generic case, changes in material properties and package capabilities. Data for the analyses were obtained from a shipper survey and from projections of shipments that would occur in an equilibrium fuel cycle supporting one hundred 1000-MW(e) reactors. Population exposures were deduced from point source radiation formulae using separation distances derived for scenarios appropriate to each shipping mode and to each exposed population group. Fourteen alternatives were investigated for the generic impact case. All showed relatively minor changes in the overall radiological impact. Since the radioactive material transport is estimated to be fewer than 3 latent cancer fatalities (LCF) for each shipment year (compared to some 300,000 yearly cancer fatalities or 5000 LCF's calculated for background radiation using the same radiological effects model), a 15% decrease caused by shifting from passenger air to cargo air is a relatively small effect. Eleven alternatives were considered for the fuel cycle/special train study, but only one produced a reduction in total special train baseline LCF's (.047) that was larger than 5%.

44273 (CONF-780506—22) **Review of criteria for nuclear criticality safety control in transportation.** Thomas, J.T.; Smith, D.R. (Oak Ridge National Lab., Tenn. (USA); Los Alamos Scientific Lab., N.Mex. (USA)). 1978. Contract W-7405-ENG-26. 20p. Dep. NTIS, PC A02/MF A01.

From 5. symposium on packaging and transportation of radioactive materials; Las Vegas, NV, USA (7 May 1978).

Basic elements in the review of criteria for nuclear criticality safety in transportation are the magnitudes of reactivity changes that may occur to a shipment of packages and those inherent in the regulatory procedure of assessment. The generic representation of criticality of reflected arrays of uncontained fissionable materials is used as a basis for comparison of packaged fissionable materials. The reactivities associated with array changes and perturbations representative of credible conditions that may occur in storage or transportation are summarized for air-spaced units of fissionable materials. Calculations of packaged fissionable material determined reactivities associated with similar changes to arrays of packages. Typical thermal insulating materials being studied are Celotex, wood, Foamglas, and a bonded vermiculite. The effect on the array neutron multiplication of these, with and without steel as an inner and outer container material, is examined. The present stage of the study has produced results illustrating the variable margin of subcriticality manifested by the criteria. Depending upon the packaging, mass loading and array reflector condition, the margin of subcriticality can be of the order of 1% in k/sub eff/.

44274 (Y/OA—2034) **Cargo-Restraint-Transporter (CRT): a novel approach to the handling of cargo on DOE's Safe-Secure Trailers (SST).** Ramsey, W.E.; Burger, T.N. (Oak Ridge Y-12 Plant, Tenn. (USA)). May 1978. Contract W-7405-ENG-26. 10p. (CONF-780506—24). Dep. NTIS, PC A02/MF A01.

From 5. symposium on packaging and transportation of radioactive materials; Las Vegas, NV, USA (7 May 1978).

Safe-Secure Trailers (SST) loading and tie-down techniques, initial design conception, basic design criteria, and cargo-restraint-transporter (CRT) loading operation are discussed. The CRT is a multi-container double-tiered cargo transport system that consolidates cargo items of various configurations into a single unit. (LK)

44275 (Y/OWI/SUB—77/42513) **Current status and future considerations for a transportation system for spent fuel and radioactive waste.** Anderson, R.T.; Darr, D.G.; Godfrey, W.L.; Keely, R.B.; Lusk, E.C.; Peterson, R.W.; Ridihalgh, J.L.; Shallo, F.A.; Young, M. (Allied-General Nuclear Services, Barnwell, S.C. (USA)). Feb 1978. Contract W-7405-ENG-26. 481p. Dep. NTIS, PC A21/MF A01.

This report is part of the OWI Transportation/Logistics systems analysis of problems associated with shipping these wastes to waste terminal storage facilities. It covers governmental regulations and functional responsibilities, highway and rail transportation status and economic considerations, assessment of present industry capabilities and business-related considerations, important receiving facility considerations, necessary engineering and licensing-related aspects of packaging systems, and essential elements of reprocessing plant waste activities including packaging and transportation. (DLC)

MARKETING AND ECONOMICS

44276 (EPRI-EA—725) **Foreign uranium supply. Final report.** McLeod, N.B.; Steyn, J.J. (NUS Corp., Rockville, Md. (USA). Energy Systems Div.). Apr 1978. 332p. Dep. NTIS, PC A15/MF A01.

This report presents an assessment of the extent to which foreign uranium may be available to United States utilities in the short term (through 1980), the intermediate term (1981—1985), and the long term (1986—95). All free world foreign uranium producers and prospects are included, with particular emphasis on Australia, Canada, southern Africa, France, and French-speaking Africa. The assessment includes reserves, resources, exploration and prospects; firm and potential production capacity and prospects; national policies and relevant political and economic conditions; foreign uranium demand; etc. Conclusions are: Foreign supply capability is greater than foreign demand in the near term. The current availability of uncommitted future Australian production presents an unusual opportunity for establishing commercial relations with very substantial producers. Foreign uranium contracts represent an increase in diversity of supply and access to resources but have less assurance of supply than do domestic contracts. However, uncertainties can frequently be accommodated within an overall procurement program, thereby retaining the diversity and price advantages of foreign procurement. The practice of market pricing of contracts reduces the incentives for foreign contracting.

WASTE MANAGEMENT

REFER ALSO TO CITATION(S) 44253, 44254

44277 (EUR—5749) **Communities R and D Programme: radioactive waste management and storage. 1. Annual progress report.** (Commission of the European Communities, Brussels (Belgium)). 1977. 78p. Dep. NTIS (US Sales Only), PC A05/MF A01.

The European Community's programme is the first and to this date the only joint international action dealing with those issues, which might well become decisive for the future of nuclear energy - the management and storage of radioactive waste. The first Annual Progress Report describes the scope and the state of advancement of this indirect action programme. At present 24 research contracts with research institutes in almost every member country of the EC are either signed or in the final stages of negotiation. The objective of the R and D actions to be achieved by 1980 is the demonstration of either the technical potential or, for further advanced projects, the feasibility and even the industrial availability of methods for treating and stoping radwaste. The following aspects are investigated: processing of solid waste from reactors, reprocessing plants and the plutonium manufacture; intermediate and terminal storage of high activity and alpha wastes; advanced waste management methods as the storage of gaseous waste and the separation and transmutation of actinides. In addition to the scientific-technical R and D actions, a survey of the legal, administrative and financial problems encountered in radwaste management and storage is an essential part of the Communities' programme.

WASTE PROCESSING

REFER ALSO TO CITATION(S) 44303

44278 (AECL—5800, pp 81-85) **Fixation of radioactive waste in glass.** Merritt, W.F. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Apr 1977.

In Nuclear power: the Canadian issues. A submission from Atomic Energy of Canada Limited to The Royal Commission on Electric Power Planning in response to The Commission's Issue Paper No. 1 'Nuclear power in Ontario'.

The Chalk River Nuclear Labs process for incorporating acidic reprocessing wastes into a nepheline syenite glass is described. Glass blocks buried beneath the water table in a configuration that does not significantly raise the ground water temperature show very low leaching rates. Preleaching or improved glass compositions can profoundly depress leaching rates.

44279 (EUR—5801) **Separation and recycling of actinides: a review of the state of the art.** McKay, H.A.C.; Sowerby, M.G.; Bustraan, M.; Montizaan, J.; van Dalen, A.; Verkerk, B. (Commission of the European Communities, Brussels (Belgium)). 1977. 178p. Dep. NTIS (US Sales Only), PC A09/MF A01.

The principal objective of this study is to assess the state of the art of separating the actinides and recycling them to reactors. To this end, the literature has been surveyed, discussions have been held at the contractors' laboratories, AERE, Harwell, UK and ECN, Petten, Netherlands, and visits have been paid to the establishments where relevant work is in progress. The study does not include any new experimental work, but a certain amount of computation has been carried out to support it. A programme of installation of reactors within the European Communities was supplied for the purposes of this study. The prospective generating facilities in GW(e) are given. The situation in the various areas of investigation involved is as follows: nuclear physics: favourable; chemical separations: difficult, but probably feasible; nuclear incineration strategies: little studied so far; fuel and fuel elements containing recycled actinides: little development so far.

44280 (ICP—1148) **Pilot-plant development of a Rover waste calcination flowsheet.** Birrer, S.A. (Allied Chemical Corp., Idaho Falls, Idaho (USA). Idaho Chemical Programs - Operations Office). Apr 1978. Contract EY-76-C-07-1540. 28p. Dep. NTIS, PC A03/MF A01.

Results of eight runs, six using the 10-cm dia and two using the 30-cm dia pilot-plant calciners, in which simulated first-cycle Rover waste was calcined, are described. Results of the tests showed that a feed blend consisting of one volume simulated first-cycle Rover waste and one or two volumes simulated first-cycle zirconium waste could not be successfully calcined. 5 figs., 8 tables.

44281 (MLM—2517) **Volume reduction system for solid and liquid TRU waste from the nuclear fuel cycle: January—March 1978.** Alexander, B.M.; Batchelder, D.A.; Doty, J.W.; Lewis, E.L. (Mound Facility, Miamisburg, Ohio (USA)). 5 May 1978. Contract EY-76-C-04-0053. 17p. Dep. NTIS, PC A02/MF A01.

The laboratory cyclone incinerator, which started operation in January, 1978, has been developed to study the effects of burning feed containing radionuclides other than ^{238}Pu. These isotopes must be removed from the off-gas during incineration. Preliminary data from early runs show that the combustion efficiency of the incinerator can still be improved. Controlled experiments were conducted on the pressed ash-cement pellet matrix to define compressive strength, mechanical stability, density, and effect of curing environment (wet cure and dry cure). Leachability studies were initiated on pressed sludge/cement matrix in distilled water at ambient temperature. Compressive strengths of sludge/cement pressed matrix samples were investigated. Physical and chemical attributes of incinerated ash were evaluated in relationship to the ash/cement matrix. 7 figs., 6 tables.

44282 (ORNL/TM—6388) **Volume reduction of low-level contaminated metal waste by melting: selection of method and conceptual plan.** Copeland, G.L.; Heestand, R.L.; Mateer, R.S. (Oak Ridge National Lab., Tenn. (USA)). Jun 1978. Contract W-7405-ENG-26. 21p. Dep. NTIS, PC A02/MF A01.

A review of the literature and prior experience led to selection of induction melting as the most promising method for volume reduction of low-level transuranic contaminated metal waste. The literature indicates that melting with the appropriate slags significantly lowers the total contamination level of the metals by preferentially concentrating contaminants in the smaller volume of slag. Surface contamination not removed to the slag is diluted in the ingot and is contained uniformly in the metal. This dilution and decontamination offers the potential of lower cost disposal such as shallow burial rather than placement in a national repository. A processing plan is proposed as a model for economic analysis of the collection and volume reduction of contaminated metals. Further development is required to demonstrate feasibility of the plan.

44283 **Method for treating radioactive waste water.** Tanno, M. (to Shin Tohoku Chemical Industry Co., Ltd.). US Patent 4,087,375. 2 May 1978. Priority date 7 May 1975, Japan. 6p.

Corrosive radionuclides, other radionuclides and fission-products contained in the primary cooling water employed in light-water type nuclear reactors and waste water discharged from the reprocessing of neutron irradiated nuclear fuels (both being referred to as radioactive waste water hereunder) can be rendered harmless to man by being adsorbed and captured by mordenite and the mordenite which has captured said nuclides is sintered to a ceramic form, thereby sealing and fixing the nuclides in said sintered mordenite.

44284 **Device for filling a container with radioactive wastes.** Wase, K. (to Hitachi Ltd., Tokyo (Japan)). Japanese Patent 1977-89,800/A/. 21 Jan 1976. 3p. (In Japanese).

A method is provided to fill a container with radioactive wastes while lowering a level in the container in response to the filled quantity of the radioactive wastes in the container to thereby prevent destruction of the pellet-like radioactive wastes and prevent the scattering of powdery material. Pellet-like radioactive wastes conveyed by a conveyor are thrown into a drum can located at the top end through a hopper. Load of the drum can is detected by a load cell to transmit a signal to an adjuster. The adjuster causes a vertically driving electric motor to be run in response to said detection signal. When the rotative shaft is rotated, a threaded rod is rotated through a bevel gear so that a threaded nut in engagement with the threaded rod is moved down. Accordingly, a bed for receiving the drum can moves down as the pellet-like radioactive wastes is filled to maintain the dropping height of pellets constant.

44285 **Method of processing liquid radioactive wastes.** Kadoya, S.; Nomi, M.; Hayashi, T.; Kawazu, H. (to Ebara Mfg. Co. Ltd., Tokyo (Japan)). Japanese Patent 1977-89,799/A/. 20 Jan 1976. 6p. (In Japanese).

A method is claimed to subject boron-containing radioactive waste to pH adjustment, which is thereafter solidified with asphalt, thereby reducing processing time and cutting down the quantity of heat used for heating. Structure: A pH-value adjusting agent such as sodium hydroxide is added into the radioactive waste containing boron to maintain pH from 7 to 11. The radioactive waste and molten asphalt are simultaneously supplied to a centrifugal film type evaporation device or the molten asphalt is prestirred within a heating and mixing tank, into which radioactive waste is gradually added for mixing and stirring. Then, the asphalt mixture is poured into the vessel to form it into a solidified body.

44286 **Method of filling with radioactive wastes.** Kamiya, K.; Yusa, H.; Kikuchi, M. (to Hitachi Ltd., Tokyo (Japan)). Japanese Patent 1977-85700/A/. 9 Jan 1976. 4p. (In Japanese).

A filling method particularly suitable for the storage of solid wastes, which can enhance the strength against the impact force of a storage container is claimed. A holding container such as a cage interiorly filled with radioactive wastes is put in a storage container such as a drum can, and a thermoplastic filler such as asphalts is

heated and filled into all of clearances within the container in a state with the radioactive wastes filled, and then cooled and solidified, after which it is sealed. A quantity of radioactive materials in the solidified matter obtained by the present invention into sea water is small, i.e. 1/2 as compared with conventional solidified matter, and a minimal amount of radioactive material is achieved when the cage is arranged in the middle of the drum can.

44287 Method of processing radioactive vent gases. Otaka, H.; Taniguchi, T. (to Hitachi Ltd., Tokyo (Japan)). Japanese Patent 1977-84,400/A/. 7 Jan 1976. 3p. (In Japanese).

A method is claimed to recycle vent gases to reduce the generation quantity of gases, thereby making a device in a tank vent system smaller. Air within a room from each sludge storage tank in a system solid waste process may be used as the agitating air to process together a large quantity of contaminated air discharged to a tank vent system to average the radioactive concentration of air different in concentration from that of high and low radioactive sludge storage tanks for recycling-use, and when rated concentration is reached, the air is transferred to the exhaust system. As a consequence, the quantity of exhaust gases can be minimized and also, the processing capacity of the tank vent system can be minimized.

WASTE DISPOSAL AND STORAGE

REFER ALSO TO CITATION(S) 44301, 44304

44288 (AECL—5800, pp 69-79) **Management of nuclear waste.** Hart, R.G. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Apr 1977.

In Nuclear power: the Canadian issues. A submission from Atomic Energy of Canada Limited to The Royal Commission on Electric Power Planning in response to The Commission's Issue Paper No. 1 'Nuclear power in Ontario'.

The decay curves, modes of toxicity, and volumes of radioactive wastes are explained and compared with familiar hazards like mercury and the wastes of coal combustion. Interim storage of spent CANDU fuel is in a demonstration stage and planning is proceeding for disposal of fuel reprocessing wastes in a glass matrix underground in salt beds or plutons.

44289 (CANMET—76-19) **Disposal of solid wastes and liquid effluents from the milling of uranium ores.** Moffett, D. (Department of Energy, Mines and Resources, Ottawa, Ontario (Canada). Canada Centre for Mineral and Energy Technology). Jul 1976. 76p. Dep. NTIS (US Sales Only), PC A05/MF A01.

Current Canadian practice in the milling of uranium-bearing ores commonly involves fine grinding followed by acid leach/ion exchange. The acid leach may be followed instead by solvent extraction. Alkaline leaching has been done, and in situ bacteriological leaching is of interest. Tailings disposal operations are necessary and create environmental problems. Uranium-mill wastes are unique because of their radioactivity. Some of the radioisotopes present may require an individual control procedure. Radium-226 is particularly important because it is the most hazardous of all isotopes found in the tailings. Acid and heavy-metal removal is conventionally done by the addition of lime, but other means are available, such as with limestone, sodium hydroxide, ammonia, silicon alloys or by sulphide precipitation. Modifications to unit operations in the mill process may be required to produce more acceptable effluents. Increased water recycling may be necessary to meet regulatory standards.

44290 (DP—1482) **Effect of internal alpha radiation on borosilicate glass containing Savannah River Plant waste.** Bibler, N.E.; Kelley, J.A. (Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.). May 1978. Contract EY-76-C-09-0001. 18p. Dep. NTIS, PC A02/MF A01.

Effects of internal alpha radiation on borosilicate glass, a perspective matrix for long-term storage of Savannah River Plant (SRP) radioactive waste, were evaluated in samples containing 45 wt % simulated waste [$Fe(OH)_3$—MnO_2] and either 0.5 wt % ^{244}Cm or 1 wt % ^{239}Pu. A glass containing ^{238}Pu without waste was also studied for comparison. The glasses were examined for changes in physical stability, leachability, and dilatation. Alpha dose rates in the test glasses ranged from 4.5×10^{14} to 1.3×10^{15} alpha dis/(g-day). After 420 days, microcracks had formed; however, no macrostructural damage to the glasses was observed. Leachabilities for ^{244}Cm and ^{238}Pu were $< 7 \times 10^{-8}$ g/(cm^2-day) and were not affected by the radiation. Continuous leaching by water for 5 days removed $< 10^{-5}$% of the isotopes. Alpha radiolysis caused expansion of the simulated-waste glasses in proportion to dose. Application of these results to glass containing radioactive Savannah River Plant waste indicated that internal alpha radiolysis will not cause detrimental effects during long-term storage ($> 10^6$ years) of the waste glass.

44291 (NVO—193) **Assessment of the Nevada Test Site for low-level waste management.** (Reynolds Electrical and Engineering Co., Inc., Mercury, Nev. (USA); Department of Energy, Las Vegas, Nev. (USA). Nevada Operations Office). Feb 1978. 55p. Dep. NTIS, PC A04/MF A01.

This report presents a summary of description information, facilities, and operating practices at the Nevada Test Site. It is concluded that NTS is not only a feasible location for surface and near-surface storage of low-level wastes, but also a potential site for underground storage of higher level wastes.

44292 (RHO-CD—78(Rev.)) **Assessment of Hanford burial grounds and interim TRU storage.** Geiger, J.F.; Brown, D.J.; Isaacson, R.E. (Atomics International Div., Richland, Wash. (USA). Rockwell Hanford Operations). Aug 1977. Contract EY-77-C-06-1030. 71p. Dep. NTIS, MF A01.

A review and assessment is made of the Hanford low level solid radioactive waste management sites and facilities. Site factors considered favorable for waste storage and disposal are (1) limited precipitation, (2) a high deficiency of moisture in the underlying sediments (3) great depth to water table, all of which minimize radionuclide migration by water transport, and (4) high sorbtive capacity of the sediments. Facilities are in place for 20 year retrievable storage of transuranic (TRU) wastes and for disposal of non-transuranic radioactive wastes. Auxiliary facilities and services (utilities, roads, fire protection, shops, etc.) are considered adequate. Support staffs such as engineering, radiation monitoring, personnel services, etc., are available and are shared with other operational programs. The site and associated facilities are considered well suited for solid radioactive waste storage operations. However, recommendations are made for study programs to improve containment, waste package storage life, land use economy, retrievability and security of TRU wastes.

44293 (UCRL—13835) **Review of liquid-tank interaction analysis technique.** (EA and T Co., Inc., Marina del Rey, Calif. (USA)). Dec 1977. Contract W-7405-ENG-48. 50p. Dep. NTIS, PC A03/MF A01.

Based on a literature survey, various models of increasing sophistication and complexity are presented which might be used to assess the liquid tank interaction effects due to sloshing of contained high level radioactive liquid waste in storage tanks at the NFS site. In addition, the effects of liquid damping, tank bending modes, and nonlinearity of the sloshing liquid are discussed. The results of the survey indicate that due to the compexities encountered in adequately modeling the system, due to the approximations which must be made as regards the tank boundary conditions, and due to the assumptions which must be made regarding the liquid waste dynamic character, the liquid tank interaction at NFS can not be adequately theoretically modeled. It is therefore recommended that experimental scale model tests be performed to assess the effects of liquid tank interaction during seismic excitation of the NFS waste tanks.

44294 (UCRL—13837) **Environmental effects on metal structures and connection in NFS waste tanks.** (EA and T Co., Inc., Marina del Rey, Calif. (USA)). Dec 1977. Contract W-7405-ENG-48. 38p. Dep. NTIS, PC A03/MF A01.

The integrity of the existing NFS high-level waste tanks was evaluated, based upon information available in the literature. Failure modes were identified and analyzed. The occurrence of stress-corrosion cracking (SCC) was established as the most probable failure mechanism. Factors that would minimize the occurrence of SCC were identified as post-welding stress relief and control of the NO^-_3-to-NO^-_2 ratio within the waste.

44295 (UCRL—13839) **Evaluation of the integrity of existing NFS waste tanks.** (EA and T Co., Inc., Marina del Rey, Calif. (USA)). Dec 1977. Contract W-7405-ENG-48. 24p. Dep. NTIS, PC A02/MF A01.

Various means of investigating the integrity of the existing NFS waste tanks are presented, including: visual inspection, ultrasonic testing, acoustic-emission monitoring, radiography, and forced-vibration testing. The experience that exists in performing such investigations of high-level radioactive waste tanks is documented, including: visual inspections, photography, wall-thickness measurements, and forced-vibration testing. An evaluation is made on the relative merits of the presented inspection and testing alternatives.

44296 Attitudes of the public about nuclear wastes. Rankin, W.L.; Nealey, S.M. (Battelle Memorial Inst., Seattle). *Nucl. News;* **21**: No. 8, 112-117(Jun 1978).

The disposal of nuclear wastes has become an important public issue in the past few years. In 1960, only a very small percentage of the American public questioned the safety of waste disposal methods, and no one opposed nuclear power for waste disposal reasons. By 1974, however, a slight majority of the public believed that the disposal of nuclear wastes was a serious problem associated with nuclear power, and from 1975 on, a small percentage of the public has opposed nuclear power for waste disposal reasons. More individuals believe that the technology is not available for acceptable waste management compared to the number of individ-

uals who believe that the technology does exist. However, a majority of the public believe that modern technology can solve the waste disposal problem. Finally, nuclear technologists evaluate waste disposal problems differently from other groups. For instance, nuclear technologists believe that short-term safety is more important than long-term safety regarding waste disposal, while other groups, especially environmentalists, believe that long-term safety is more important than short-term safety. Nuclear technologists are willing to accept a higher level of waste management-related risk than other groups and evaluate waste disposal problems as being less severe than other societal problems.

44297 (ORNL-tr—4567) **Deformation of a jointed rock mass.** Stephansson, O. (Kaernbraenslesaekerhet, Stockholm (Sweden)). 1977. Translation by L. Murphy of KBS-TR—29. 88p.

Simple shear is a common tectonics in nature. Stress distribution, deformations and failure of a rock mass in direct shear loading is examined. If the strength of the rock mass is in the form of the Coulomb-Navier criterion one set of tensile fractures and two sets of shear fractures arise. The sets of joints predicted by the theory have been used in the mathematical modelling. Two computer models have been applied to the analysis of the jointed rock mass; the Discrete Block Method (DBM) and the Finite Element Method (FEM). DBM simulates the motion of a set of discrete blocks each one having the possibility of unlimited translation and rotation. Shear forces arise due to friction, damping forces are introduced to dissipate kinetic energy and contact forces and displacements are determined. Three blocky rock models have been tested. One model simulates the deformation in a shear box. The two others simulate a regular and unregular jointed rock mass subjected to direct shear. Displacements and total deformation are more flexible as the number of blocks increases for one and the same model. Finite element analysis of a jointed rock mass is presented. The rigid blocks are assumed to be of linear elastic material and the joints are simulated by means of joint elements. Square blocks of dimension 4 x 4 km are cut by two sets of joints and the block is sheared an angle of 0.5°. In models with a large joint spacing the rigid blocks reach contact at few points under high stresses. Models with small joint spacing show a more gentle and flexible mode of deformation and the stresses are much lower. Models loaded along the edges behave similar. Results of the DBM and FEM analysis in this study indicate that a suitable rock mass for repository of radioactive waste should be moderately jointed (about 1 joint/m^2) and surrounded by shear zones of the first order.

44298 **Method of storing radioactive wastes.** Kikuchi, M.; Kamiya, K.; Sugimoto, Y. (to Hitachi Ltd., Tokyo (Japan)). Japanese Patent 1977-85699/A/. 9 Jan 1976. 4p. (In Japanese).

A method is claimed to decrease the number of storage containers filled with radioactive wastes. A wire-netting containers having a capacity of 67 liters is filled with 60 kg of pellet-like radioactive solid material. The wire-netting container is held in the middle of a drum can, and asphalt is poured between the drum can and the wire-netting container and stored until radioactivity is attenuated. After storage, the stored body is heated to melt the asphalt and the wire-netting container is removed. Thereafter, the pellet-like radioactive solid material is taken out of the wire-netting container and combined with the other pellet-like radioactive solid material similarly taken out of the storage container, and the resultant material is filled into a wire-netting container having a capacity of 167 liters every 150 kg, and inserted again into the same drum can, into which recovered asphalt is poured for final storage.

44299 (ORNL-tr—4632) **Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system.** Kawamoto, T.; Terai, R.; Hara, S.; Hiroha, K.; Takino, T. Translated by T.E. Ohtani from *Osaka Kogyo Gijutsu Shikenjo Kiho;* **27**: No. 2, 75-84(1976). 17p. Dep. NTIS, PC A02/MF A01.

To develop the glassy materials suitable for the long-term storage of high level radioactive wastes, chemical durability of the glasses composed of 5 approximately to 35 SiO_2, 15 B_2O_3, 25 Na_2O, 5 approximately to 35 CaO, 20 approximately to 50 waste oxides (Al_2O_3 + Fe_2O_3) by wt % has been investigated. The test was carried out by continuous leach method for a week and for 280 days to obtain the leach factor. Boro-silicate glasses with low melting point can include waste oxides up to 30 wt %. Based on leach of the most leachable B_2O_3 component, leach factor for original glass composed of 5 SiO_2, 15 B_2O_3, 25 Na_2O, 25 CaO, 15 Al_2O_3, 15 Fe_2O_3, by wt % varied from 1.0 to 2.3 x 10^5 $(cm/week)^{-1}$ in accordance with leaching time, but it decreased to the range 4.5 x 10^3 - 1.4 x 10^4 $(cm/week)^{-1}$ after devitrification by heat treatment. From the viewpoint of safety, chemical durability of the boro-silicate glasses was satisfactory, although that of the devitrified sample was unsatisfactory.

44300 (ORNL-tr—4626) **Chemical durability of glasses suitable for the storage of high level radioactive wastes. I. On the mechanism of dissolution of the glasses of borax-alumina-silica system in water.** Terai, R.; Hara, S.; Kawamoto, T.; Nanbu, T.; Nakamura, T. Translated by T. Ohtani from *Osaka Kogyo Gijutsu Shikenjo Kiho;* **26**: No. 3, 118-130(1975). 22p. Dep. NTIS, PC A02/MF A01.

To develop the glassy materials suitable for the long-term storage of high level radioactive wastes, the chemical durability of the glasses of borax-alumina-silica system has been investigated. The tests were carried out by (1) glass-disk immersion method, (2) continuous leach method, and (3) method prescribed in JIS-R3502. In the continuous leach method, glass grains were exposed to circulating water at a constant temperature for a week to obtain the leach factor or leach rate. It was found from the experimental results that, as the silica content increased, the melting temperature of the glasses progressively increased and the chemical durability was considerably improved, and that B_2O_3 and Na_2O constituents were preferentially dissolved in water leaving relatively insoluble components such as SiO_2 and Al_2O_3. The rate at which B_2O_3 and Na_2O in glass are leached out is governed by three processes, that is, (1) the boundary reaction on the glass surface, (2) the diffusion process through the hydrated layer, and (3) the disintegration of hydrated layer. The first process probably corresponds to the hydration of boric oxides on the glass surface or to the ion exchange between protons in solution and Na^+ ions in glass, and the second process seems to correspond to the diffusion of protons through the hydrated layer on the glass surface. Although the ratio of $[Na\text{-}BO_4]/[BO_3]$ in the borax-silica glasses was determined to be 0.5 by means of NMR measurement, Na_2O/B_2O_3 ratio in leached solution was less than 0.5, indicating that $[BO_3]$ groups in glass were more soluble than $[Na\text{-}BO_4]$ groups. From the viewpoint of appreciation of safety, the chemical durability of the glasses of borax-alumina-silica system was rather unsatisfactory, but that of the glasses containing silica in quantities was comparable to the soda-lime silicate sheet glasses.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 44272

44301 (DOE/EV—0005/7) **Formerly utilized MED/AEC sites remedial action program. Radiological survey of site A, Palos Park Forest Preserve, Chicago. Final report.** (Department of Energy, Washington, D.C. (USA). Div. of Environmental Control Technology). Apr 1978. Contract W-31-109-ENG-38. 91p. Dep. NTIS, PC A05/MF A01.

The principal finding of this study of Site A (CP-2, CP-3 Reactors) and Plot M (burial site) is the presence of tritium (as water) in the Plot M area and in the three wells to the north. No abnormal amounts of radioactivity were found in any other Forest Preserve District wells or in any private wells. The only radionuclide in the Site A core samples attributable to operations at the Site is tritium. The concentrations were substantially less than in the Plot M area. Elevated concentrations of uranium and plutonium were found on the surface of the bed of a swale 50 to 200 feet north and downhill of Plot M. Average values over this area were about 10 pCi/g U and 0.2 pCi/g for Pu. The only important pathway for exposure to the public from the radionuclides buried in Plot M is from the tritiated water moving from the Plot to the dolomite aquifer and consumed by individuals using the picnic wells. The possible dose to people from this pathway is estimated at 0.7 mrem/y as compared to the EPA drinking water standard of 4 mrem/y. Elevated tritium concentrations were found in the soil around and beneath Plot M; they decrease with increasing distance from the Plot. Tritium has been found in the subsoil as deep as samples have been collected, so it must be assumed that the ground beneath and immediately around the Plot contains tritium down to the dolomite aquifer about 130 feet deep. The total tritium content in this area is estimated to be about 3000 Ci. In the three waterways that drain the Plot, the Illinois and Michigan Canal, Des Plaines River, and Chicago Sanitary and Ship Canal, tritium from the Plot was not detected. Small amounts of other radionuclides (U, Pu, ^{90}Sr) have been found in boreholes beneath the concrete cap covering the Plot, but not in the subsoil outside of the Plot. (14 figs, 36 tables)

44302 (PNL—2607) **Mobility of organic complexes of some non-TRU fission and activation products: a selective review.** Wiggins, D.J.; Franz, J.A. (Battelle Pacific Northwest Labs., Richland, Wash. (USA)). May 1978. Contract EY-76-C-06-1830. 39p. Dep. NTIS, PC A03/MF A01.

Zr, Nb, Ni, and possibly Tc are mobile in the presence of aqueous organic complexing agents to a certain extent. Low pH appears to be required for efficient complex formations with organic ligands in aqueous media. Zr complexes with a number of synthetic chelating agents such as EDTA, and DTPA to form stable, water-soluble complexes in acidic and neutral aqueous systems. Zr also complexes with HIMDA or HXG to form a stable, water soluble complex in any aqueous system and with α-hydroxy carboxylic acids

in alkaline aqueous systems. Uncomplexed Zr would be readily absorbed by or precipitated on soil. It is predicted that the organic complexes of Zr would be absorbed less by soil than uncomplexed zirconium. Nb generally forms the most stable complexes with nitrogen containing chelating ligands such as EDTA, and less stable complexes with α-hydroxy carboxylic acids and monodentate ligands. Uncomplexed Nb would be efficiently absorbed by or precipitated on soil from aqueous systems. Despite the high stability constants of complexed Nb, one would predict that organic complexes of niobium would be absorbed by soil because of hydrolysis of complexed Nb to insoluble hydrous niobium oxide. Ni complexes strongly with a number of oxygen and nitrogen containing organic ligands. Uncomplexed Ni is absorbed by soil in acidic and neutral aqueous systems and precipitated on soil in alkaline aqueous systems. Two complexes of Ni are known to be absorbed to a much lesser extent by soil (Ni-DTPA, Ni-EDTA). Fulvic acid and synthetic chelating agents are known to greatly enhance the movement of Ni in soil and to reduce Ni absorption by soil. Tc complexes with organic ligands in a reducing environment but the behavior of these complexes in a nonreducing environment is unknown. 8 tables, 3 figs. 62 refs.

44303 (BNWL-tr—311) **Measurement of the distribution of ^{129}I in and its discharge from the Karlsruhe Reprocessing Plant.** Berg, R.; Schuttelkopf, H. (CONF-771139—2). Mar 1978. Translated from pp 1-10 of a symposium on radioactive effluents from nuclear fuel reprocessing plants, Karlsruhe, November 22-24, 1977. 18p. Dep. NTIS, PC A02/MF A01.

Since 1975, measurements of ^{129}I have been carried out in almost all solutions and in the exhaust air of the Karlsruhe Reprocessing Plant (WAK). Samples from the air are collected by solid filters containing AC 6120. The solutions are treated radiochemically according to their composition. The separated ^{129}I was measured either by x-ray spectrometry or by neutron activation. During dissolution, more than 99% of the calculated ^{129}I inventory is released into the offgas. The separation efficiency of offgas scrubbers was measured. ^{129}I contents of the clean-air mixture from the dissolver offgas and of the vessel offgas and of the offgas from the high-level waste solutions have been measured since the start of 1975. Residual iodine in the feed solution was analyzed. After concentration of the high-level waste solution, the iodine in the concentrate and in the offgas of the concentrate vessel was measured once again. The ^{129}I discharged with low-level liquid waste has been monitored for almost two years. The solutions resulting from distillative purification of medium-level and low-level liquid wastes, as well as the liquid wastes from the final storage pools, have also been monitored in terms of their ^{129}I content for almost two years. From the results acquired, the complete iodine balance of the Karlsruhe Reprocessing Plant is established.

44304 (ORNL-tr—4598) **Calculation of potential danger of stored wastes.** Bechthold, W.; Diefenbacher, W. (Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (Germany, F.R.)). [nd]. Translated by S.D. Blalock Jr. from pp 209-216 of KFK—2380. 7p. Dep. NTIS, PC A02/MF A01.

This paper examines which radionuclides are important to the operation of a radioactive storage depot. In air, the most dangerous nuclides are ^{90}Sr and ^{244}Cm; in water, ^{90}Sr. 4 figs., 1 table.

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 44253, 44254, 44268, 44270, 44293

REGULATIONS

ACCOUNTABILITY AND SAFEGUARDS

44305 (AECL—5902) **INMACS - An approach to on-line nuclear materials accounting and control in a fuel fabrication environment.** Yan, G.; L'Archeveque, J.V.R.; Paul, R.N. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Aug 1977. 11p. (CONF-7706126—5). Dep. NTIS (US Sales Only), PC A02/MF A01.

From 17. Canadian Nuclear Association conference; Montreal, Quebec, Canada (5 Jun 1977).

Taking advantage of modern system technologies, the concept of an Integrated Nuclear Materials Accounting and Control System (INMACS) was formulated as an alternative solution to manual inventory procedures. The selected approach offers prospects for tackling the more general fissile materials inventory problem while satisfying the immediate requirements of the Fuel Fabrication Pilot Line at CRNL. A PDP-11/40 minicomputer system was purchased, and a Data Base Management System (DBMS) was designed and implemented to provide a uniform file handling capability. The specific requirements of the Pilot Line were met by a package of application programs. About 16 man-years have been spent on the project. INMACS has been installed in the field and its usefulness as an on-line inventory system will be demonstrated in the Pilot Line.

44306 (HCP/D0789—01) **Systematic approach to the conceptual design of physical protection systems for nuclear facilities.** (Sandia Labs., Albuquerque, N.Mex. (USA)). May 1978. Contract EY-76-C-04-0789. 90p. Dep. NTIS, PC A05/MF A01.

A three-step approach is described which includes (1) facility characterization, (2) development and evaluation of hardware-based safeguards systems configurations, and (3) hardware and response force trade-off analysis. The purpose of the report is to establish a vehicle for initial examination and discussion by potential industry and government users of a formal sequence of activities for the conceptual design of physical protection systems and to identify currently available design tools, such as application reports, handbooks, and computer codes which might support these activities. 17 figs.

44307 (KFK—2465) **Annual report of the Nuclear Safeguards Project 1976.** (Kernforschungszentrum Karlsruhe (Germany, F.R.). Projekt Spaltstoffflusskontrolle). Jul 1977. 121p. (In German). Dep. NTIS (US Sales Only), PC A06/MF A01.

The present report describes the major activities carried out in 1976 in the framework of the Nuclear Safeguards Project by the institutes of the Gesellschaft fuer Kernforschung Karlsruhe, the European Institute of Transuranium Elements and some industrial firms.

44308 (LA—7212-MS) **Feasibility of nondestructive assay measurements in uranium enrichment plants.** Walton, R.B. (Los Alamos Scientific Lab., N.Mex. (USA)). Apr 1978. Contract W-7405-ENG-36. 57p. Dep. NTIS, PC A04/MF A01.

Applications of nondestructive assay methods to measurement problems in uranium enrichment facilities are reviewed. The results of a number of test and evaluation projects that were performed over the last decade at ORGDP and Portsmouth are presented. Measurements of the residual holdup in the top enrichment portion of the shut-down K-25 cascade were made with portable neutron and gamma-ray detectors, and inventory estimates based on these data were in good agreement with ORGDP estimates. In the operating cascade, the tests showed that portable NaI detectors are effective for monitoring NaF and alumina media for gaseous effluent traps and that gas phase enrichments and inventories, as well as large deposits of uranium, can be detected with portable neutron and gamma-ray instrumentation. A wide variety of scrap and waste materials, including barrier and compressor blades, incinerator ash and trapping media, and miscellaneous waste, were measured using passive gamma-ray and neutron methods and 14-MeV neutron interrogation. Methods developed for rapid verification of UF_6 in shipping containers with portable neutron and gamma-ray instruments are now used routinely by safeguards inspectors. Passive assay methods can also be used to measure continuously the enrichments of ^{235}U and ^{234}U in the UF_6 product and tails withdrawals of a gaseous diffusion plant. A system that was developed and installed in the extended-range product withdrawal station of the Portsmouth facility measures enrichment with a relative accuracy of 0.5%. A stand-alone neutron detector has also been successfully evaluated for the measurement of the isotopic abundance of ^{234}U in UF_6 in sample cylinders, an application of potential importance to Minor Isotope Safeguards Technology. Recommendations are made on the role of NDA measurements for enrichment plant safeguards, including additional tests and evaluations that may be needed, particularly for advanced uranium enrichment processes.

44309 (NUREG/CR—0027) **Capability for intrusion detection at nuclear fuel sites.** (Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. (USA)). Mar 1978. 103p. NTIS $6.50.

A safeguards vulnerability assessment was conducted at three separate licensed nuclear processing facilities. Emphasis was placed on: (1) performance of the total intrusion detection system, and (2) vulnerability of the system to compromise by insiders. The security guards were interviewed to evaluate their effectiveness in executing their duties in accordance with the plant's security plan and to assess their knowledge regarding the operation of the security equipment. A review of the training schedule showed that the guards, along with the other plant employees, are required to periodically attend in-plant training sessions. The vulnerability assessments continued with interviews of the personnel responsible for maintaining the security equipment, with discussions of detector false alarm and maintenance problems. The second part of the vulnerability assessments was to evaluate the effectiveness of the intrusion detection systems including the interior and the perimeter sensors, CCTV surveillance devices and the exterior lighting. Two types of perimeter detectors are used at the sites, a fence disturbance sensor and an

infrared barrier type detector. Infrared barrier type detectors have a higher probability of detection, especially in conjunction with dedicated CCTV cameras. The exterior lights satisfy the 0.2 footcandle illumination requirement. The interior intrusion detection systems included ultrasonic motion detectors, microwave motion detectors,balanced magnetic switches, and CCTV cameras. Entrance doors to the materials access areas and vital areas are protected with balanced magnetic switches. The interior intrusion detection systems at the three nuclear processing sites are considered satisfactory with the exception of the areas protected with ultrasonic motion detectors. (DLC)

44310 (SAND—77-1029) **Description, operation, and diagnostic routines for the adaptive intrusion data system.** Corlis, N.E.; Johnson, C.S. (Sandia Labs., Albuquerque, N.Mex. (USA)). Mar 1978. Contract EY-76-C-04-0789. 72p. Dep. NTIS, PC A04/MF A01.

Portions of document are illegible.

An Adaptive Intrusion Data System (AIDS) was developed to collect data from intrusion alarm sensors as part of an evaluation system to improve sensor performance. AIDS is a unique digital data compression, storage, and formatting system. It also incorporates a capability for video selection and recording for assessment of the sensors monitored by the system. The system is software reprogrammable to numerous configurations that may be utilized for the collection of environmental, bi-metal, analog, and video data. This manual covers the procedures for operating AIDS. Instructions are given to guide the operator in software programming and control option selections required to program AIDS for data collection. Software diagnostic programs are included in this manual as a method of isolating system problems.

44311 (SAND—77-1591) **Intrusion-detection via adaptive prediction.** Ahmed, N. (Sandia Labs., Albuquerque, N.Mex. (USA)). Apr 1978. Contract EY-76-C-04-0789. 25p. Dep. NTIS, PC A02/MF A01.

This report discusses aspects of an intrusion-detection approach which employs an adaptive digital predictor (ADP). The ADP serves as an effective noise decorrelator, thereby reducing the detection problem to that of determining the presence or absence of an intruder in noise which is essentially uncorrelated. Thus, techniques available in classical detection theory (e.g., a simple moving average filter) are applicable at the output of the ADP. Related experimental results involving a variety of noise sources are also included in the report.

44312 (SAND—78-0364C) **Fault tree analysis for vital area identification.** Varnado, G.B.; Ortiz, N.R. (Sandia Labs., Albuquerque, N.Mex. (USA)). 1978. Contract EY-76-C-04-0789. 4p. (CONF-780606—1). Dep. NTIS, PC A02/MF A01.

From Institute of Nuclear Materials Management meeting; Cincinnati, OH, USA (27 Jun 1978).

The use of fault tree analysis techniques to systematically identify (1) the sabotage events which can lead to release of significant quantities of radioactive materials, (2) the areas of the nuclear power plant in which the sabotage events can be accomplished, and (3) the areas of the plant which must be protected to assure that release does not occur are discussed.

44313 (SAND—78-0377) **Evaluation methodology based on physical security assessment results: a utility theory approach.** Bennett, H.A.; Olascoaga, M.T. (Sandia Labs., Albuquerque, N.Mex. (USA)). Mar 1978. Contract EY-76-C-04-0789. 113p. Dep. NTIS, PC A06/MF A01.

This report describes an evaluation methodology which aggregates physical security assessment results for nuclear facilities into an overall measure of adequacy. This methodology utilizes utility theory and conforms to a hierarchical structure developed by the NRC. Implementation of the methodology is illustrated by several examples. Recommendations for improvements in the evaluation process are given.

44314 (UCRL—81005) **Overview of the M.A.I.T. analysis system (machine analysis of the internal threat).** NiCastro, J.R. (Scott Paper Co., Chester, Pa. (USA)). 10 Apr 1978. Contract W-7405-ENG-48. 10p. (CONF-780529—1). Dep. NTIS, PC A02/MF A01.

From 3. meeting concerning the role of behavioral; Arlington, VA, USA (2 May 1978).

The problem of the internal threat epitomized by the tactics of collusion and illicit use of access has been structured into a data processing format. The format procedures and analysis are objective; the flexibility of the method allows the security analyst to input his judgment and opinions into the code. By so doing he can interact and determine the effects of interacting with the safeguard system.

44315 (ORNL-tr—4621) **Supervision of fissionable fuel in nonproliferation.** Translated by S.D. Blalock Jr. from *Energiespectrum;* **1**: No. 7-8, 232-235(Jul 1977). 5p. Dep. NTIS, PC A02/MF A01.

The history of the development of international control of nuclear weapons, including the Lilienthal—Baruch plan and the IAEA, is surveyed. Necessary additions to the IAEA safeguards are discussed. The number of IAEA inspectors needed in each large plutonium facility is considered. The Euratom supervision system, now partially integrated into the IAEA system, is described. A round-table discussion of the subject of safeguards is reported. (DLC)

44316 **Homemade nuclear bomb syndrome.** Nelson, W.E. Columbia, MO; Univ. of Missouri (1977). 107p. University Microfilms Order No. 78-03,748.

Thesis (Ph. D.).

This work discusses the hindrances that a malefactor would have to overcome in his attempts to acquire the necessary materials for the construction of a nuclear device. The methods of nuclear materials control that were used in the past, are presently employed, and are envisioned for the future are discussed. Use denial methods are examined and are shown to complement the nuclear materials control programs. International nuclear materials controls are also discussed. The characteristics of reactor grade materials are presented. The problems associated with attempting to work with reactor grade plutonium; radiation hazard, metallurgical problems, self heating, predetonation, etc., are discussed. Also presented is a method for approximating the energy release from a nuclear device. A risk versus benefit study is presented. The societal risk method of examining the nuclear materials control programs is discussed and shown to be a valuable tool for pointing out possible weaknesses in the nuclear materials control programs. A comparison of plutonium and more conventional hazardous substances is presented in order to show that the desirability of plutonium as a terrorist weapon has been greatly overrated. Also discussed is the recent policy statement by President Carter that the United States will forego the utilization of plutonium in order to halt the proliferation of nuclear weapons. The problems that will arise from this policy are noted. It is concluded that while the present programs aimed at strengthening the nuclear materials controls should continue to be pursued, the public has been misled as to the ease of acquiring the requisite materials and the construction of a nuclear device. It is also clearly understood that while reactor grade materials do not lend themselves to ready assembly of a nuclear device, they must still be effectively safeguarded.

44317 **Analytical laboratory to facilitate international safeguards.** Clark, B.E.; Muellner, P.; Deron, S. (International Atomic Energy Agency, Vienna (Austria)). pp 265-287 of Design of and equipment for hot laboratories. Vienna; IAEA (1976).

From Symposium on the design of and equipment for hot laboratories; Otaniemi, Finland (2 Aug 1976).

Member States which have concluded safeguards agreements accept safeguards on part or all of their nuclear facilities and nuclear materials. The Agreements enable the Agency to make inspections in order to verify the location, identity, quantity and composition of all safeguarded nuclear material. The independent analysis of samples of safeguards material is an essential part of the verification process. A new analytical laboratory has been made available to the Agency by the Austrian Government. This facility is staffed by the Agency with scientists and technicians from five Member States. Design criteria for the laboratory were defined by the Agency. Construction was carried out under the project management of the Oesterreichische Studiengesellschaft fuer Atomenergie Ges.m.b.H. Scientific equipment was procured by the Agency. Samples of feed and product material from the nuclear fuel cycle will constitute the main work load. Irradiated and unirradiated samples of uranium, plutonium and mixtures of both will be analysed for concentration and isotopic composition. Since highly diluted solutions of spent fuel will be the most active beta-gamma samples, shielded and remote manipulation facilities are not necessary. Ptentiometry, mass spectrometry and coulometry are the main techniques to be employed. Gravimetry, alpha and gamma spectrometry and emission spectroscopy will also be utilized as required. It is not intended that this laboratory, should carry the whole burden of the Agency's safeguards analytical work, but that it should function as a member of a network of international laboratories which has been set up by the Agency for this purpose.

FUSION FUELS

PROCESSING

FABRICATION AND TESTING

44318 **Cryogenic microshell pellets and other advanced targets for laser fusion.** Henderson, T.M.; Solomon, D.E.; Jacobs, R.B.; Wuttke, G.H.; Musinski, D.L.; Simms, R.J. (KMS Fusion, Inc., Ann

Arbor, MI). pp 305-316 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

An apparatus to produce layers of liquid and/or solid deuterium-tritium inside glass and polymer hollow spherical pellets is described. Such pellets have been used as cryogenic targets in neutron-producing experiments with the KMSF Nd:glass laser. Extensive experiments under cryogenic conditions were performed to determine the state and form of the thermonuclear fuel at the moment of arrival of the laser pulse in target-interaction experiments. Variations of this class of laser fusion targets and other advanced targets are described.

44319 Tritium handling and the preparation of DT-containing micro-targets for laser fusion experiments. Carstens, D.H.W. (Los Alamos Scientific Lab., NM). pp 317-331 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

Within the High-Temperature Chemistry Group (CMB-3) at Los Alamos Scientific Laboratory hollow micro-targets for fusion experiments are routinely filled with 50-50 DT gas at pressures ranging from 1 to 1000 atm and temperatures of 300 to 400°C. Li(D,T) targets are also prepared using the exchange of LiD spheres with tritium gas. The gas system has provisions for mixing, purifying (using a uranium-tritide bed), storing, and analyzing (using mass spectrometry) mixtures of DT gas. Although only small amounts of gas are actually used in the filling procedure, the system is capable of handling up to about four moles (90l) total. The high-pressure gas is generated using a metal hydride bed which produces the pressure via the decomposition of $V(D,T)_2$. The pump is considerably more convenient to use than conventional systems and is capable of pumping pressures of up to 1400 atm (20,000 psi). Problems and safety aspects of handling and containing bulk amounts of tritium are discussed.

WASTE MANAGEMENT

REFER ALSO TO CITATION(S) 45148

ISOTOPE AND RADIATION SOURCE TECHNOLOGY

PHYSICAL ISOTOPE SEPARATION

44320 (CONF-761220—, pp 337-338) **Study of solar assisted thermal diffusion separating systems for isotopic fuels.** Ita, L.E. (Univ. of Nevada, Las Vegas). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

It is indicated that performance of a separating column could be greatly increased by independent control of the convective velocity. In a solar separating cell, two columns of the mixture to be separated are enclosed on both sides of a plate with high absorptivity. The outer boundary of one column of mixture is of plain glass which admits direct solar radiation. The other column has as its outer boundary a plate of high emissivity. The inner plate has an internal rectangular tubular construction so that an absorbing fluid may be circulated in the plate to keep its temperature at a desired level. (MHR)

HEAVY WATER PRODUCTION

44321 Enrichment of hydrogen isotopes using the low-temperature glow-discharge technique. Geosling, C.E.; Manuccia, T.J. (Laser Physics Branch, Naval Research Laboratory, Washington, D.C. 20375). *J. Appl. Phys.;* **49**: No. 5, 2605-2610(May 1978).

Deuterium enrichments are reported for flowing methane/hydrogen mixtures subjected to a glow discharge at low temperatures. Dependence of the enrichment factor on initial D/H ratios, flow rates, system pressure, discharge energies, and translational temperature of the reacting gas mixture was studied. In addition to enrichment measurements, details of the estimate of energy requirements for enrichment of deuterium from natural abundance are included.

RADIATION SOURCES

DESIGN AND FABRICATION

44322 Sources of nuclear radiation. Thackray, M. (to Australian Atomic Energy Commission). US Patent 4,085,331. 18 Apr 1978. Priority date 30 Oct 1975, Australia. 8p.

A uniform source of nuclear radiation is produced by converting a convertible surface portion of a body. The conversion can be by chemical combination or reaction, neutron bombardment, ion exchange of an element present in the convertible material with a solution of radioactive ions of the element or by permitting the radioactive particles to be embodied into the surface portion. A preferred embodiment uses conventional photographic film in which the silver halide grains are treated chemically with a radioactive material.

44323 Method and apparatus involving the generation of x-rays. Neal, W.R.; Little, R.G. (to Simulation Physics). US Patent 4,075,489. 21 Feb 1978. Filed date 21 Jan 1977. 6p.

An electron gun assembly generates an accelerated and sharply focused electron beam which is deflected in a predetermined path to impinge upon an extended split anode structure in a selected scanning pattern with approximately half the beam current impinging on each half of the split anode. A signal proportional to the difference between the two currents from each half of the split anode provides feedback control to the beam deflection system for constraining the beam to follow the fissure of the split anode. X-rays which are generated at the point of beam impingement on the split anode constitute a moving source of x-rays as the point of beam impingement travels in the selected pattern along the anode.

ISOTOPIC POWER SUPPLIES

44324 (AD-A—048780) **Safety methodology for space nuclear systems. Final report.** Holtzscheiter, E.W.; Kelleher, D.; Mitchell, G.W.; Crawford, M.L.; Sholtis, J.A. (Air Force Weapons Lab., Kirtland AFB, N.Mex. (USA)). Oct 1977. 74p. (AFWL-TR—77-104). NTIS PC A04/MF A01.

Radioisotopic thermoelectric/thermodynamic generator (RTG) systems are frequently used to power Department of Defense (DOD) and National Aeronautics and Space Administration (NASA) satellites. The launch of RTGs dictates that the user agency assure the Interagency Nuclear Safety Review Panel that risks to the populace are minimal and exposures below acceptable levels for any logically conceivable accident scenario and environment. Each agency (Energy Research and Development Administration (ERDA), NASA, and the DOD) participating on the panel performs an independent safety evaluation of the system under review and recommends action for the RTG Contractor's Safety Analysis Report. Typical techniques and results are discussed. Particular attention is paid to the analyses and test results for the Multihundred Watt RTG used in the Lincoln Experimental Satellites 8 and 9 (LES 8/9). Specific details of the nuclear safety analysis of the LES 8/9 mission are set forth. Other analysis methods used and future methodology development goals are also discussed.

HYDROGEN

44325 Hydrogen - energy carrier of the future. Huebner, R. *Elektr. Energ. Tech.;* **22**: No. 1, 1-4(Feb 1977). (In German).

The properties of hydrogen and its advantages over conventional energy carriers are described along with the main possibilities of production, transport, and storage of hydrogen and its applications.

PRODUCTION

REFER ALSO TO CITATION(S) 44059

44326 (DOE/ET—0046) **Hydrogen Energy Storage Program: five-year plan.** (Department of Energy, Washington, D.C. (USA). Div. of Energy Storage Systems). Apr 1978. 56p. Dep. NTIS, PC A04/MF A01.

Major elements of the Hydrogen Energy Storage Program that are covered in depth in this report are production, storage, transmission and distribution, use, supporting research and technology, system studies, and project management. Production studies include electrolysis, thermochemical cycles, and advanced concepts. The advancement of metal hydride and occluder material hydrogen

storage methods is a principal area of investigation; both stationary and vehicular applications are covered. Underground hydrogen storage will be addressed. The basic approach taken in hydrogen transport is that of evolving requisite technology from the present state-of-the-art in gas transmission and distribution systems, including the limited hydrogen systems which are in service. Hydrogen use in the industrial, residental and commercial, and electric and natural gas utilities sectors is specifically addressed in this program. Two areas of specific interest to be covered in the supporting research and technologies program element are: (1) containment materials for hydrogen and (2) safety in hydrogen operations. (LK)

ELECTROLYSIS

REFER ALSO TO CITATION(S) 44390, 44399

THERMOCHEMICAL PROCESSES

44327 (LA—7234-PR) **Thermochemical processes for hydrogen production. Progress report, August 1, 1977—February 28, 1978.** Cox, K.E. (comp.). (Los Alamos Scientific Lab., N.Mex. (USA)). 1978. Contract W-7405-ENG-36. 14p. Dep. NTIS, PC A02/MF A01.

The Los Alamos Scientific Laboratory's (LASL) program to study thermochemical processes for hydrogen production from water consists of three major areas: cycle evaluation and developing new methodology to evaluate thermochemical cycles. The Thermochemical Cycle Evaluation Panel is being assisted to perform engineering and economic analyses of selected cycles. Analytical and experimental studies are made in direct support of the two cycles selected for early development and evaluation. The cycles are the hybrid sulfuric acid cycle (Westinghouse) and the sulfuric acid-iodine cycle [General Atomic (GA)]. One study is directed at heat penalties associated with drying sulfuric acid solutions, a significant problem in both cycles. Oue analysis indicates that the precipitation of an insoluble, anhydrous metal sulfate could significantly reduce such heat penalties. Experimental studies are being made of the precipitation and decomposition of bismuth sulfate, which appears to be a promising candidate. Use of fusion energy sources from the production of synthetic fuels (hydrogen) is being evaluated. Thermochemical cycle input data are being provided in the form of cycle thermal requirements to design study groups at each laboratory being supported by DOE Office of Fusion Energy. Initially, a hybrid sulfuric acid cycle with a bismuth sulfate decomposition step at high temperature is being explored.

STORAGE

REFER ALSO TO CITATION(S) 44326

INDUSTRIAL AND COMMERCIAL USE

REFER ALSO TO CITATION(S) 44326

OTHER SYNTHETIC AND NATURAL FUELS

REFER ALSO TO CITATION(S) 44348, 44388

HYDROCARBON FUELS

44328 (NTIS/PS—78/0054) **Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970—1977.** Cavagnaro, D.M. (National Technical Information Service, Springfield, Va. (USA)). Feb 1978. 207p. NTIS PC N01/MF N01.

The production of methane is discussed in this bibliography containing worldwide citations. The reports pertain to the manufacturing processes, equipment used, performance, economics, and combustion technology. Many of the studies cover the production of methane from wastes, especially agricultural wastes. (Contains 200 abstracts)

PREPARATION

CHEMICAL SYNTHESIS

REFER ALSO TO CITATION(S) 44044, 44045

44329 (DES—77-1) **Draft environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company.** Neilsen, F. (Federal Energy Administration, Washington, D.C. (USA)). Dec 1976. 365p. Dep. NTIS, PC A16/MF A01.

This draft EIS evaluates the social, economic, and environmental impacts which may occur as a result of the FEA's action on Indiana Gas Company's application. These impacts range from those associated with the construction and operation of the SNG plant to those associated with fuel switching and shortages which may occur if the naphtha allocation is denied and the plant is not built. This report addresses only those impacts which may occur within the gas company's service area. The SNG plant, to be located in Pike Township, a surburb of Indianapolis, is to have the capacity to produce 60,000 mcf of SNG per day or 20,820,000 mcf per year (347 days operation). Compliance with federal and state air quality standards is expected, with the possible exception of the SO_2 24-hour EPA regulation; methods to mitigate this and other impacts were assessed. The relationship between short-term uses of the environment versus long-term productivity is evaluated. Alternatives to the proposed action are considered. (DLC)

44330 (FES—77-1) **Final environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company.** (Federal Energy Administration, Washington, D.C. (USA)). Sep 1977. 266p. Dep. NTIS, PC A12/MF A01.

FEA is considering an allocation of naphtha feedstock of 3.8 million barrels per year to the Indiana Gas Company for operation of its proposed synthetic natural gas (SNG) plant in Pike Township, a rural suburb of Indianapolis. With an expected SNG output of 20,820,000 Mcf per year, this plant will provide about 20% of the total gas supply available to Indiana Gas. Operation of the plant is expected to result in annual pollution emissions: 1374 tons of sulfur oxides, 272 tons of nitrogen oxides, and 35 tons of particulate matter. Incremental emissions due to plant operation relative to existing emissions in Marion County are less than 1%. Compliance with Federal and State primary and secondary ambient air quality standards is expected. The EIS predicts a potential violation of the EPA regulation for the prevention of significant air quality deterioration for sulfur oxide in a Class II area, based on preliminary engineering designs. This potential violation can be avoided through several methods. Effluents discharged into the county sewer system and a nearby stream should have no impact except under abnormal conditions with small probability of occurrence. Water consumption requirements of 600,000 gallons are not expected to significantly tax the area's water resources. Potential noise impacts were determined to be negligible. All other operational impacts on population, roads, community facilities and services, and ecological systems were judged to be minimal. Environmental impacts resulting from various alternatives ranging from full allocation through denial of an allocation are discussed. The analysis of the alternatives of no allocation or a partial allocation highlights loss of jobs and associated wages due to non-availability of gas supplies. To the extent that some industrial and commercial users would use fuel oil as an alternate fuel, the end result would be an increase in air contaminant emissions.

44331 **Thermochemical process for producing methane and oxygen.** Schulten, R.; Behr, F. (to Rheinische Braunkohlenwerke AG). US Patent 4,085,200. 18 Apr 1978. Priority date 20 Feb 1976, German, Federal Republic of (F.R. Germany). 8p.

The invention comprises a recirculatory process for producing methane and oxygen in which iodine and an oxide in a lower valency stage are reacted with methanol, dimethylether or a mixture thereof at an elevated temperature to form the corresponding oxide having a higher valency stage and methyl iodide. The methyl iodide is reacted with water to form hydrogen iodide and reform the methanol and/or dimethylether. The hydrogen iodide is reacted with carbon dioxide to form methane and water and the oxide in the higher valency state is decomposed to release oxygen and reform the oxide having a lower valency state. The methane and released oxygen are removed and the remaining components are recirculated.

44332 **Method to produce synthesis gas.** Marion, C.P. (to Texaco Development Corp., New York (USA)). German(FRG) Patent 2,557,684/A/. 1 Jul 1976. 41p. (In German).

The invention deals with a method to produce synthesis gas by circulating the carbon particles contained in the synthesis waste gas. The soot occuring in the production of synthesis gas (by partial oxidation of hydrocarbons) is removed in a H_2O wash. The water charges itself with 0.5-3.0 wt.% carbon. This soot is extracted from the washing water in a mixing and separation vessel with a liquid, light hydrocarbon or a liquid, organic byproduct from the oxo or oxyl synthesis. After separation, the water is recycled into the washing. The carbon-extracting agent dispersion is separated in a centrifuge separation zone in a greatly and weakly C-charged flow. The latter is recycled after degasification. The greatly charged flow is mixed with heavy, liquid hydrocarbon, e.g. fuel oil, and by

fractionated distillation is separated into a light extracting agent flow which is recycled into the extraction, and a heavy hydrocarbon fuel containing all the soot. This pumpable hydrocarbon-soot slurry is added to the synthesis gas generator as additional fuel.

PREPARATION FROM WASTES OR BIOMASS

REFER ALSO TO CITATION(S) 44386

44333 Prospects of biogasproduction from agricultural organic residues. Baader, W. (Forschungsanstalt fuer Landwirtschaft Braunschweig-Voelkenrode, Braunschweig (Germany, F.R.). Inst. fuer Landmaschinenforschung). pp 133-142 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 24: Biokonversion. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

By means of data on the process and materials to be digested it is shown that for biogasproduction with high efficiency different preconditions have to be performed by proper controlling. Hereby results a high technical expense. The considerable gas requirement for heating the digester and the reduced possibilities of using the surplus gas on the farm, as well as the expense for realizing the process limit considerably the dissemination of the biogassystem in agriculture.

44334 Technology of putrefraction of organic material for production of methane. Loll, U. (Technische Hochschule Darmstadt (Germany, F.R.). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung). pp 143-153 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 24: Biokonversion. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

In the microbacteriological breakdown of organic substances under anaerobic conditions a mixture of gases containing about 65% to 85% methane is set free. For this process various plants, refuse after harvesting, organic wastes from communities and industrial installations, and manure from animal feed lots can be used as biomass. In this paper the most important processing steps for energy generation, as well as the application possibilities and limitations, are described.

44335 Process for production of gas rich in methane which can be exchanged for natural gas. Baron, G.; Bratzler, K.; Ehrhard, E.; Herbert, W. (to Metallgesellschaft A.G., Frankfurt am Main (Germany, F.R.)). German(FRG) Patent 1,545,463/C/. 11 Nov 1976. 3p. (In German).

Liquid carbohydrates with an upper limit of boiling of 350°C and a mean C number of 10 to 20 are cracked with the addition of steam using 1.5 to 3 kg of steam per kg of carbohydrate under normal and increased pressure at temperature below 450°C in the presence of a catalyst. The catalyst is a carrier catalyst with 10 to 40% by weight of nickel on magnesium silicate which should be free of clay, with an activating additive of 0.05 to 0.3% by weight of platinum. The cracked gas cooled to 200 to 250°C is taken to a methanising stage, in which the same catalyst can be used. The carbondioxide produced is then washed out and the product gas, which is rich in methane, is dried.

44336 Method and equipment for producing synthetic fuel from wastes. Antal, M.J. Jr. (to Energy Research and Development Administration, Washington, D.C. (USA)). German(FRG) Patent 2,612,040/A/. 7 Oct 1976. 17p. (In German).

According to the invention, a H_2, CO, CO_2 and CH_4 containing producer gas and a solid coal residue are produced by pyrolysis and gasification of solid organic wastes with cobalt molybdate or $NaHCO_3$ as catalyst. Steam or CO_2 or a mixture of both gases is heated up to 600°C by an external, moderate temperature heat source and fluidizes the reactor bed whilst flowing into the reactor. The bed consists of a mixture of ground, solid organic waste material and a catalyst. By selecting the catalyst and the suitable temperature of the working flow medium, the adaptation to different types of waste and the production of a H_2, CH_4 or CO-rich gas as well as the formation of methanol from CO and H_2 is achieved. The patent claim further deals with the use of a pinnacle solar furnace as external heat source, the chemical reactor being in its focal point. Focussed sunlight streams through two quartz windows which form an outer chamber flowed through by hot CO_2 and steam at one end of the reactor, and this CO_2 is absorbed in the inner chamber on the surface of the coal in the fluidized bed and is converted into heat. Steam and/or hot CO_2 flows through perforations in the inner quartz window into the inner chamber and fluidizes the bed. The fire-ground organic solids in the inner chamber are pyrolized upon contact with the flow medium. The gases are recirculated under pressure in the outer chamber. The invented method is compared to the state of technology and especially to the Purox pyrolysis process, and its similarities, deviations and advantages compared to these methods are given.

44337 High quality methane gas through modified anaerobic digestion. Ort, J.E. (to ERA, Inc.). US Patent 3,981,800. 21 Sep 1976. vp.

ERA, Inc.'s new waste gasification process produces relatively pure (98 percent or greater) methane gas, without incurring scrubbing costs, by subjecting relatively conventional anaerobic digestion to a pressure of 29 to 75 psig (2 to 5 atm) and incorporating pressurized recirculation in a practical application of Henry's Law. Such pressurized anaerobic digestion increases carbon dioxide availability as a hydrogen acceptor for biological methane gas formation. Depressurizing sludge which has been digested under pressure, and then recirculating it for further digestion under pressure, strips or scrubs from the digested sludge those acid gases, such as carbon dioxide and hydrogen sulfide, formed in and along with the sludge during digestion. Such stripping or scrubbing increases the quality of methane gas produced. Anaerobic pressurized digestion of organic solid waste (such as manure), with the recirculation of the depressurized sludge, yields about 0.5 lb of sludge (90 wt percent or higher solids content) and over 3.5 CF (at 800 psig) of high-quality (at least 98 percent pure) methane gas per pound of organic solid-waste feed, even when some of the produced methane gas has been used for heating recirculating sludge, for drying dewatered (35 to 45 wt percent solids) sludge, and for compressing produced methane gas from a pressure of 36 psig up to 800 psig.

PREPARATION

REFER ALSO TO CITATION(S) 44387

44338 Liquid synfuel photosynthesis: intentions and examples. Radebold, R.; Seiler, W. (Arbeitsgruppe Technische Photosynthese, Berlin (Germany, F.R.)). pp 183-193 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 24: Biokonversion. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

One of the most stringent tasks for research is understood to be the storage of solar energy in form of metastable, liquid chemical compounds of high specific energy in order to replace oil and its products by these compounds which should have a broad range of application in our technical world. Hydrazine-hydrate as well as hydrogen peroxide will possibly be a future synfuel and its oxidator. Emphasis is given to explain synthesis of both agents starting from water and nitrogen using alkali metals, their oxides and imides to be intermediate reactants. Two reaction schemes including the photochemical energy input are proposed.

SOLID WASTE FUELS

44339 Producing energy from straw and wood waste. Strehler, A.; Hofstetter, E.M. (Bayerische Landesanstalt fuer Landtechnik, Freising (Germany, F.R.)). pp 155-165 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 24: Biokonversion. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

In West Germany about 4 million tons of straw and about 14 million tons of wood are available annually, for which there is not an important economic use. This corresponds to an energy potential of 10 million tons of coal equivalent, or 6.86 million tons of heating oil. This heat content could be used for heating and drying operations. For this purpose special heating installations are needed. Some installations are already on the market, while others are being developed. A two phase burning process is necessary in order to achieve a high efficiency while still staying within admissible emission levels. An economic use of wood and straw for process heat in agricultural applications exists at the current price levels.

44340 Energy extraction from vegetative fuels: wood gasification. Neuhaus-Schwermann, A. (IMBERT Energietechnik G.m.b.H., Arnsberg (Germany, F.R.)). pp 167-174 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 24: Biokonversion. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The energy extraction out of biomass fuels will have an increasing significance in the future. Extensive R and D has already taken place in many countries, in order to determine which biomasses are appropriate for use as fuels and to determine how they can be utilized for this purpose, particularly with respect to agricultural and forest refuse products. The present paper will show that

the IMBERT-technology - which has demonstrated its value in hard economic times many times over - handles the problems of energy conversion without detrimental environmental side effects. Large research investments have brought this technology to its current stage, where it is now capable of handling the requirements of the present age.

SOLAR ENERGY

44341 (CONF-761220—, pp 3-4) **History of solar utilization.** Yellott, J.I. (Arizona State Univ., Tempe). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44342 **Today's and tomorrow's energy sources for homes.** Krinninger, H. (Fachhochschule Muenchen (Germany, F.R.). Fachbereich Versorgungstechnik). pp 433-442 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 30: Markteinfuehrung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The constantly increasing energy consumption, together with the foreseeable exhaustion of various fossil fuels in just a few decades, compels one to a serious consideration of which energy source will be used for homes of the future. The present paper shows that solar energy for homes represents an ecologically clear alternative which, within just a few years, will be economically profitable in comparison to the conventional fossil energy sources.

44343 **Use of solar energy equipment in developing countries as an example for a 'soft technology' and the possibilities for its promotion.** Purper, G. pp 487-497 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 31: Energietechnologien fuer Entwicklungslaender. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

'Soft technologies' are technologies which both quantitatively and qualitatively fit the needs of the developing countries. From solar plants, which satisfy these requirements, one can expect - in combination with other soft technologies - positive economic impulses for the developing countries. Prerequisites for the succcessful transfer of solar technologies include a number of accompanying measures on the part of the German Federal Government, which primarily consist of information and consulting services.

44344 **Profession of the 'solar crafter'.** Binkert, H. pp 535-540 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 32: Neue Berufsbilder. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

For a wise and successful application of solar technologies optimally trained technicians and workmen skilled in some areas of competence are needed. In the field of trades, heating, plumbing, control systems installation, roofing and insulating professions are of concern. This contribution attempts to associate solar applications with that trade offering the best prerequisites for the new area of operation.

44345 **Short course on solar technology for heating and plumbing tradesmen.** Hammer, O. (Zink (W.) Solartechnik, Nuertingen (Germany, F.R.)). pp 541-548 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 32: Neue Berufsbilder. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The expectations of home builders and the rapid development of solar technologies demand that those tradesmen who include this novel technology in their program specialize in the new field. ZinCo as producer of collectors and other solar equipment has initiated a short course system for heating and plumbing professions designed to offer knowledge and practical skills on solar energy matters on various levels of specialization. Up to now, 2,600 participants have registered to various seminars. The experience with and the results of the first two years confirm the necessity and the usefulness of the program.

RESOURCES AND AVAILABILITY

REFER ALSO TO CITATION(S) 44467

44346 (CONF-761220—, pp 339) **Solar radiation data base development based on bright sunshine data.** Smith, G.E. (Univ. of Calgary, Alberta). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

ECONOMICS

44347 (CONF-761220—, pp 425-426) **Commercialization of solar heating and cooling of buildings.** Johnson, A.C. (MITRE Corp., McLean, VA). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The transition from research, development, and demonstration through federal support to normal economic operation is discussed. (MHR)

44348 (ERHQ/2322—77/4) **System for projecting the utilization of renewable resources. SPURR methodology.** Rebibo, K.; Bennington, G.; Curto, P.; Spewak, P.; Vitray, R. (Mitre Corp., McLean, Va. (USA). METREK Div.). Sep 1977. Contract EX-76-C-01-2322. 38p. Dep. NTIS, PC A03/MF A01.

A System for Projecting the Utilization of Renewable Resources (SPURR) was developed. SPURR consists of a computer simulation model and an energy data base containing engineering cost data on solar and conventional technologies in four market sectors--heating and cooling of buildings, process heat, electric utility, and production of synthetic fuels and products--as well as data defining likely future scenarios. The SPURR computer model, described here, simulates on a year by year basis the market decisions to purchase solar (or other new energy options) and conventional technologies in each of the four market sectors in each region of the U.S. to satisfy a given energy demand. The simulation accounts for regional differences in climate, fuel costs and energy demand; cost reductions on new technologies based on projected experience; and certain interactions among the market sectors. Market decision algorithms for use in SPURR were developed that incorporate probability of least cost; technological substitution limited by an S-shaped curve; market shares based on the relative value of competing technologies as well as the perceived risk of the new technology; and a "boom or bust" phenomenon in which a new technology captures a small share of the market even though its relative value is less than that of the competitor. The energy data base, the scenarios and their results, and METREK conclusions and recommendations are reported in separate documents described in Appendix I.

44349 **Overview and market penetration methodology of a computer simulation model for projecting solar energy utilization.** Rebibo, K.K. (Mitre Corp., McLean, Va. (USA). Metrek Div.). pp 443-453 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 30: Markteinfuehrung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977).

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The SPURR computer model, simulates on a year by year basis the market decisions to purchase solar (or other new energy options) and conventional technologies in each of the four market sectors in each region of the United States to satisfy a given energy demand. The simulation accounts for regional differences in climate, fuel cost and energy demand; cost reductions on new technologies based on projected experience; and government incentive and demonstration programs. METREK has developed market decision algorithms for use in SPURR that incorporate probability of least cost; technological substitution limited by an S-shaped curve; market shares based on the relative value of competing technologies as well as the preceived risk of the new technology; and 'boom or bust' phenomenon in which a new technology can initially capture a small share of the market even though its relative value is less than the competitor.

44350 **Managing innovation in newly established solar energy enterprises.** Fischer, H.D. (Deutsche Wagnisfinanzierungs-Gesellschaft m.b.H., Frankfurt am Main (Germany, F.R.)). pp 471-483 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 30: Markteinfuehrung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Drawing on his experience as consultant to WFG, the new German venture capital organisation, and using WFG's evaluation criteria as a framework the author stresses the critical importance of the following factors: 1) entrepreneurship and functional management skills; 2) knowledge of the market and the competitive environ-

ments; 3) finance and all its implications; 4) technical competence. Newly established companies are unlikely to be successful with their innovation projects if serious deficiencies exist in any one of these areas.

ENVIRONMENTAL, LEGAL, AND INSTITUTIONAL ASPECTS

REFER ALSO TO CITATION(S) 44402

44351 Problems arising from the introduction of solar systems in the FRG. Problem identification and remedies. Weidlich, B. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). pp 351-364 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 28: Baurecht und Siedlungsplanung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Technological innovations normally go through a lengthy procedure before they succeed on the market. This slow starting process should also be expected for the introduction of solar technologies in the Federal Republic of Germany. The market penetration can be accelerated if future problems are recognized in time and if remedies for their correction are discussed in advance. In this paper the attempt is made to recognize likely problems and to suggest remedies for their solution.

44352 Solar energy systems from the point of view of the building inspector. Gaentzsch, G. (Deutscher Staedtetag, Koeln (Germany, F.R.)). pp 375-382 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 28: Baurecht und Siedlungsplanung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Solar installations are related to legislation on city planning, municipal construction assistance and building codes. A cummunity can create favourable conditions for the solar heating of buildings by proper requirements within the plans for developments. For urban renewals the integration of solar heating systems can be part of the subsidized modernization expenditures. The present law requires that solar installations be approved by the building inspection office. An amendment of the State Building Laws should de-classify solar systems and require only notifications. As a rule, a legal claim exists with regard to the issuance of an approval. Points of buildings aesthetics may be considered only in precincts of historic value or in rural areas where traditional architectures are conserved.

44353 System for applied digestion of information about solar technology. Gust, D. pp 457-470 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 30: Markteinfuehrung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

A discrepancy exists between the very optimistic predictions regarding solar energy utilization and the concrete application possibilities. In the current literature a sharp distinction is seldom drawn between that which has worked out in practical tests and that which has just functioned in some experiment or even which is just in the stage of a 'Gedanken' experiment. Out of this, conflicting information results, and this hinders a large scale penetration of solar energy utilization. The present system integrates the technical, environmental and economic factors with respect to specific applications in the use of solar energy. This scheme incorporates the main points in an individual or societal evaluation of solar energy utilization.

44354 Solar MSF sea water desalination plant. Azhari, N. (Liebi LNC A.G., Bern (Switzerland)). pp 515-522 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 31: Energietechnologien fuer Entwicklungslaender. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977).

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

A solar multi-stage flashing sea water desalination plant is described. The solar energy input is generated by a system of LIEBI LNC collectors which appear to be perfectly suited for the purpose. Cost estimates show that the break point with oil fired MSF desalination plants is just about reached. It can be said that solar applications will be profitable from now on. Combinations of solar sea water desalination with solar cooling and greenhouses will make the system more cost-effective.

44355 Ecologically suitable use of solar energy: building block for an appropriate technology for developing and industrialized countries. Wersich, H. (Gesamthochschule Kassel (Germany, F.R.)). pp 523-532 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 31: Energietechnologien fuer Entwicklungslaender. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Solar energy has become fashionable. This has its bright but also its dark sides, since many people believe that solar energy can be commercialized by using the same methods which have been practiced up to now. In the lecture a first attempt will be made to show the application of principles and rules observable in nature (the basic bio-cybernetic principles as elaborated by F. Vester) can lead to the development of a vita-logical technology which is appropriate to the needs of both man and the environment.

SOLAR ENERGY CONVERSION

REFER ALSO TO CITATION(S) 44609

PHOTOVOLTAIC CONVERSION

REFER ALSO TO CITATION(S) 44435

44356 (DOE/JPL/954355—4) **Large area silicon sheet by EFG. Fourth quarterly report, October 1, 1977—December 31, 1977.** Wald, F.V. (Mobil Tyco Solar Energy Corp., Waltham, Mass. (USA)). 15 Jan 1978. Contract NAS-7-100-954355. 117p. Dep. NTIS, PC A06/MF A01.

A detailed economic evaluation is presented of several EFG ribbon growth technology scenarios using the "SAMICS" interim price estimation guidelines. It is concluded that the growth of 10 ribbons from a double five ribbon furnace of the general type represented by the existing Machine 3A would meet the requirements of producing ribbon at a price below $20/m^2$ the 1986 goal. The technology requirements are that one operator can operate 2 of the 5 ribbon growth stations in which each ribbon grows at a speed of 7.5 cm/min and is also 7.5 cm wide. The machines also would have to achieve a duty cycle of 67% at minimum and yields above 75%. Finally, silicon must be available at $10 to approximately $25/kg, depending on the yield assumed. These conclusions are the final results of the economic analysis. The progress towards the growth of 7.5 cm wide ribbon at 7.5 cm/min is discussed. Also, fluid flow phenomena have been investigated and it is shown that by utilization of such phenomena the impurity distribution in the ribbon may be manipulated to a significant extent. Also, using a somewhat novel "EBIC" technique it was demonstrated that the internal grain structure found previously in some ribbons grown at high speeds has virtually no influence on the performance of the material when made into a solar cell.

44357 (DOE/JPL/954589—3) **Low Cost Silicon Solar Array Project, Silicon Materials Task. Development of a process for high capacity arc heater production of silicon for solar arrays. Quarterly technical report, July—September 1977.** Fey, M.G. (Westinghouse Electric Corp., Trafford, Pa. (USA). Power Circuit Breaker Div.). 1977. Contract NAS-7-100-954589. 39p. Dep. NTIS, PC A03/MF A01.

Major emphasis was focused on obtaining price data for the various system components required for a plant that produces 1000 MT/year of silicon based on a recycle scheme. This data will serve as the basis for the economic analysis for 1000 MT of silicon per year production. Work continued on the system purity analysis which will predict the maximum allowable impurities in the feedstocks ($SiCl_4$ and sodium) based on a desired purity of the silicon product. The computer program, CHEMEQ, has been modified for this purity analysis. Also, the activity coefficients of Fe, Cr, Mn, and Al in liquid silicon at several temperatures have been obtained. These are the metallic impurities in silicon that are being considered for the purity analysis along with Ti and V. Estimation of values for the activity coefficients for Ti and V in liquid silicon is still in progress. System components and cost information have been assembled for the $SiCl_4$ feed system, sodium feed system, plasma reactor/separator system, and the silicon collection system. This data is being factored into the capital equipment costs for the economic analysis for the 1000 MT of Si/year case. Effort was continued to specify and assemble cost information for the NaCl electrolysis system that is necessary for the recycle process envisioned to produce 1000 MT of silicon/year.

44358 (DOE/JPL/954898—1) **Phase 2, automated array assembly, Task IV, Low Cost Silicon Solar Array Project. Quarterly report No. 1, November 1, 1977—January 28, 1978.** (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif. (USA)). Jan 1978. Contract NAS-7-100-954898. 61p. Dep. NTIS, PC A04/MF A01.

Technical and economic evaluations are discussed on the selected process sequence consisting of: starting material CZ silicon wafers, as sawn, 3 inch diameter; texture etch with NaOH; ion

implantation of phosphorus for junction formation; laser annealing; screen printing of ohmic contacts; spray-on AR coating; module assembly. Process verifications have commenced on the texturizing and ion implanting processes. Argon, ruby and YAG lasers were determined to be best suited for laser annealing having wavelengths of .5 μm, .694 μm and 1.06 μm, respectively. Arrangements are being made to utilize appropriate lasers.

44359 (N—77-33296) **Laboratory studies of silicon vapor deposition, Phase A. Final report.** Frost, R.T.; Racette, G.W.; Stockhoff, E.H. (General Electric Co., Philadelphia, Pa. (USA). Space Sciences Lab.). 22 Aug 1977. Contract NAS1-14650. 63p. (NASA-CR—145236). NTIS PC A04/MF A01.

A system is described capable of carrying out silicon vapor deposition experiments in the low 10 to the minus 10th power torr vacuum range. The system was assembled and tested for use in a program aimed at exploration of vacuum heteroepitaxy of silicon on several substrates of potential interest for photovoltaic applications. An experiment is described in which a silicon layer 2.5 micrometers, thick was deposited on a pyrolytically cleaned tungsten substrate held at a temperature of 400 C. Using a resistance heated silicon source, thicker layers can be deposited in periods of hours by utilizing closer source to substrate distances.

44360 (N—77-33604) **Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature.** Berman, P.A.; Miyahara, T.F.; Anstaugh, B.E. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 15 Aug 1977. Contract NAS7-100. 37p. (NASA-CR—155166; JPL-PUB—77-27(Rev.1)). NTIS PC A03/MF A01.

Electrical characteristics of Mariner '71 type silicon solar cells are presented in graphical and tabular format as a function of intensity and temperature.

44361 (N—77-81939) **Usable electricity from the Sun.** (National Aeronautics and Space Administration, Cleveland, Ohio (USA). Lewis Research Center). 1977. 13p. (NASA-TM—74624). NTIS PC A02/MF A01.

A brief review of the technology, cost, and uses of solar cells is given.

44362 p-n junction formation in boron-deposited silicon by laser-induced diffusion. Narayan, J.; Young, R.T.; Wood, R.F.; Christie, W.H. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Appl. Phys. Lett.;* **33**: No. 4, 338-340(15 Aug 1978).

A technique for p-n junction formation in silicon, based on deposition of boron on silicon at room temperature followed by laser irradiation is described. Transmission electron microscopy and electrical measurements indicate that as a result of the laser irradiation the boron is dissolved in the silicon and becomes electrically active. Diode characteristics of p-n junctions produced by this technique are quite good. The dopant profile distribution has been obtained using secondary ion mass spectrometry and is in qualitative agreement with simplified theoretical calculations.

44363 High-efficiency p^+-n-n^+ back-surface-field silicon solar cells. Fossum, J.G.; Burgess, E.L. (Sandia Laboratories, Albuquerque, New Mexico 87185). *Appl. Phys. Lett.;* **33**: No. 3, 238-240(1 Aug 1978).

The design and fabrication of high-efficiency p^+-n-n^+ back-surface-field silicon solar cells are described. The fabrication process has been developed to yield maximum attainable carrier lifetimes (~0.7 msec) in the base region of the cell, thereby allowing the back n-n^+ junction to effectively enhance the cell performance. A surprising conclusion drawn from a study of the device physics supporting the experimental development of the cell is that the front-surface recombination velocity controls the recombination in the emitter. That is, the bulk p^+ emitter is "transparent" to minority-carrier (electron) flow. The recognition of the significance of the front silicon surface has led to process modifications that result in improvements in both the short-circuit current density and the open-circuit voltage of the cell. With these improvements, the cells exhibit AM1 conversion efficiencies of nearly 17%. The fabrication process is reliable and reproducible with exceptionally high yield.

44364 Possible explanation for the photovoltaic effect in indium tin oxide on InP solar cells. Singh, R.; Shewchun, J. (Engineering Physics Department and Institute for Materials Research, McMaster University, Hamilton, Ontario, L8S 4M1, Canada). *J. Appl. Phys.;* **49**: No. 8, 4588-4591(Aug 1978).

Recently, Sree Harsha and co-workers reported a 14.4% efficient n-indium tin oxide/p-InP solar cell. In principle, it is difficult to visualize a high-efficiency photovoltaic device with this particular structure because of large interfacial defects due to crystal structure and lattice mismatch. However, we propose an explanation for the operation of this solar cell based on the presence of a thin interfacial insulating layer between the indium tin oxide and the InP. The operation is similar to tunnel MIS solar cells where the metal is replaced by a degenerate wide-band-gap oxide (indium tin oxide) semiconductor. Our calculations show that such semiconductor-insulator-semiconductor solar cells can yield efficiencies as high as 26% (AM2) with InP as the base semiconductor.

44365 Emitter current suppression in a high-low-junction emitter solar cell using an oxide-charge-induced electron accumulation layer. Neugroschel, A.; Lindholm, F.A.; Pao, S.C.; Fossum, J.G. (Electrical Engineering Department, University of Florida, Gainesville, Flordia 32611). *Appl. Phys. Lett.;* **33**: No. 2, 168-170(15 Jul 1978).

A new type of high-low-junction emitter silicon solar cell employing an oxide-charge-induced electron accumulation layer demonstrates complete suppression of the dark emitter recombination current J/sub E/ to values so low that the base recombination current dominates in determining the open-circuit voltage V/sub OC/. This suppression of J/sub E/ results in measured values of V/sub OC/ considerably larger than those previously reported for n-on-p silicon solar cells. This ability to suppress J/sub E/ leads to projections of efficiency of about 18% AM0 and about 20% AM1 for this oxide-charge-induced high-low-junction emitter (OCI-HLE) solar cell.

44366 Organometallic-sourced VPE AlGaAs/GaAs concentrator solar cells having conversion efficiencies of 19%. Nelson, N.J.; Johnson, K.K.; Moon, R.L.; Vander Plas, H.A.; James, L.W. (Corporate Solid State Laboratory, Varian Associates, Inc., Palo Alto, California 94303). *Appl. Phys. Lett.;* **33**: No. 1, 26-27(1 Jul 1978).

AlGaAs/GaAs heterojunction solar cells having conversion efficiencies greater than 19% have been produced on large-area substrates (13 cm^2) using the organometallic-sourced VPE process. At 1 sun (simulated AM2) these devices have open-circuit voltages of 1.01 V and short-circuit currents of 20.9 mA/cm^2. In sunlight at a flux concentration of 933 suns at AM2.1, a conversion efficiency of 19% and a fill factor of 0.757 was measured.

44367 Electrical properties of n-type epitaxial indium phosphide films. Tsai, M.; Bube, R.H. (Department of Materials Science and Engineering, Stanford University, Stanford, California 94305). *J. Appl. Phys.;* **49**: No. 6, 3397-3401(Jun 1978).

Electrical transport properties have been analyzed by Hall-effect measurements for a series of epitaxial n-type undoped InP films deposited on high-resistivity GaAs : Cr or InP : Fe substrates by metalorganic chemical vapor deposition. For electron densities less than 10^16 cm^-3, films deposited on GaAs : Cr substrates show a general increase in electron mobility with increase in electron density as small structural potential barriers play a significant role in determining the mobility. All films deposited on InP : Fe substrates had an electron density greater than 10^16 cm^-3 and exhibited behavior virtually identical to that of bulk single crystals of InP. Electron mobilities at 77 °K as high as 10 500 cm^2/V sec on GaAs : Cr substrates and 16 500 cm^2/V sec on InP : Fe substrates have been measured.

44368 SnO_2/Si solar cells: heterostructure or Schottky-barrier or MIS-type device. Ghosh, A.K.; Fishman, C.; Feng, T. (Exxon Research and Engineering Company, P.O. Box 8, Linden, New Jersey 07036). *J. Appl. Phys.;* **49**: No. 6, 3490-3498(Jun 1978).

The performance of SnO_2/Si solar cells has been measured and analyzed in detail. This has given us an insight into cell characteristics never revealed in previous studies. Though the device is a junction between two semiconducting materials, SnO_2 and Si, it performs like an MIS device and in the thin-oxide limit as a Schottky-barrier device. The dark I-V characteristics are attributed to a combination of thermionic and diffusion processes. The diode constant associated with the former is close to 2 or higher and that associated with the latter is unity. It has been demonstrated that under certain conditions the diode constant can be independent of the reverse-saturation current. An MIS-type model can explain the spectral-response curve, the short-circuit photocurrent, the open-circuit photovoltage, and the light and dark I-V characteristics. A theoretical limit of the efficiency is estimated for the device.

44369 Comparison of carrier lifetime measurements by photoconductive decay and surface photovoltage methods. Chu, T.L.; Stokes, E.D. (Southern Methodist University, Dallas, Texas 75275). *J. Appl. Phys.;* **49**: No. 5, 2996-2997(May 1978).

Minority-carrier lifetimes in silicon crystals measured by surface photovoltage and photoconductive decay methods have been compared. The results from both measurements are in reasonable agreement provided that the thickness of the sample for surface photovoltage measurements is at least twice the diffusion length.

44370 Solar cell electric and heating system. Manelas, A.J. US Patent 4,080,221. 21 Mar 1978. Filed date 9 Nov 1976. 8p.

A system for converting solar energy into electric energy at reduced cost makes use of an array of light sensitive, voltage producing solar cells of the flat disc silicon type. To increase power, while using fewer costly cells, each cell of the array has a truncated

conical shell mounted on legs at a spaced distance thereover, the shell having a mirror-like reflective inner surface. Thus, sunlight is received in the large end and reflected through the small end to the cell. A sealed, weather-tight enclosure for the array, has fluid inlets and outlets for producing heat, the heat conductive shells absorbing and radiating heat.

44371 Encapsulated solar cell assembly. Mlavsky, A.I. (to Mobil Tyco Solar Energy Corp.). US Patent 4,078,944. 14 Mar 1978. Filed date 8 Sep 1975. 8p.

An encapsulated photovoltaic solar cell assembly is described comprising at least one solar cell mounted and hermetically sealed in a substantially rigid, elongated, tubular envelope which is transmissive to actinic radiation to which the photovoltaic solar cell is sensitive. The assembly can include an antireflection coating for reducing the reflection of solar radiation from the envelope as well as reflective coatings for uniformly distributing solar radiation over the light gathering surfaces of the cell.

44372 Anti-reflective coating for silicon solar cells. Gonsiorawski, R. (to Mobil Tyco Solar Energy Corp.). US Patent 4,078,945. 14 Mar 1978. Filed date 3 May 1976. 8p.

An anti-reflective coating is formed integrally with a silicon solar cell by treating the cell with an acidic solution comprising a mixture of HF and H_2O_2.

44373 Structure and morphology of chemical-sprayed CdS films. Berg, R.S.; Nasby, R.D.; Lampkin, C. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Vac. Sci. Technol.;* **15**: No. 2, 359-362(Mar 1978).

Chemical spray pyrolysis is a technique for film growth which is of interest because of its potential for very large-scale, inexpensive production of semiconductor materials such as CdS for photoconductor and photovoltaic applications. In this study, CdS films were prepared by spraying ~0.1-M aqueous solutions of $CdCl_2$ and NH_2CSNH_2 (thiourea) onto SnO_2-coated glass substrates heated to 380°C. The films developed very intricate surface morphologies consisting of a variety of nodular and serpentine structures about 5—10 μm in size. Grain sizes were about 200 nm, with their c-axis generally normal to the local surface. The grain structure and morphology produce very large optical scattering and high effective absorption for wavelengths larger than the CdS band-gap wavelength of 500 nm. Films 3—4 μm thick typically have effective absorption constants of about 500 cm^- 1 at 1000-nm wavelength. The films were relatively impure, with total impurity contents of about 2 wt. % consisting of reaction products (principally chlorine), impurities picked up from the spray process (oxygen, iron, and others), and mobile glass species (such as sodium and potassium). These impurities may be an important factor in limiting grain size. Electrically, the carrier concentrations are on the order of 10^16 cm^-3, with mobilities of the order of 10 cm^3/V s. Some of the effects of these properties on fabricated CdS/Cu_2S photovoltaic devices are discussed.

44374 Optical performance of absorber-reflector combinations for photothermal solar energy conversion. Donnadieu, A.; Seraphin, B.O. (Optical Sciences Center, University of Arizona, Tucson, Arizona 85721). *J. Opt. Soc. Am.;* **68**: No. 3, 292-297(Mar 1978).

For a number of absorber-reflector combinations, the reflectance spectrum as well as the figure of merit a/e has been computed numerically in order to find an optimum set of parameters. Values of a/e in excess of 20 result for an absorber consisting of 0.5 μm Ge on a silver reflector, overlaid by 2.0 μm Si carrying a four-layer antireflection sequence in which the refractive index varies from 2.79 to 1.43. To maximize the optical acceptance angle the antireflection coatings must vary the refractive index in a graded profile from the value of index of silicon to the one of air.

44375 Radiation hardened P-I-N and N-I-P solar cells. Meulenberg, A. Jr.; Reynolds, J.H. (to Communications Satellite Corp.). US Patent 7 Feb 1978. 7 Feb 1978. Filed date 3 Mar 1977. 6p.

A solar cell is constructed such that the losses resulting from radiation damage are reduced without sacrificing efficiency in the unirradiated cell. This is done by using a first conductivity type junction on the front of a high resistivity cell and a second, opposite conductivity type junction on the back of the cell. The two junctions are separated by an intrinsic region, and the cell potential, which is normally reduced by using high resistivity substrate material, is instead raised by using the second junction. The cell includes a reflective back surface and a non-reflective front surface to further enhance light absorption within the active cell volume. The reflective back surface is formed by polishing the substrate. The nonreflective front surface is a multi-pyramidal or V-grooved surface formed by preferential etching of the substrate material. The front electrode is a fine geometry grid deposited over the front surface of the cell. An anti-reflection coating may additionally be provided over the front surface of the cell to further promote the non-reflective characteristics of that surface. Further, a cover slide may be cemented to the front surface of the cell.

44376 Aluminum arsenide eutectic gallium arsenide solar cell. Rahilly, W.P. (to Secretary of the Air Force). US Patent 4,070,205. 24 Jan 1978. Filed date 8 Dec 1976. 4p.

An improved gallium arsenide solar cell is provided by forming a P + layer on top of a wafer of plural vertical PN junction eutectic gallium arsenide crystal by liquid phase epitaxial growth of P doped GaAs followed by liquid phase epitaxial growth at Al/sub x/AsGa/sub 1-x/ on the surface of the vertical PN junction substrate. The deposited GaAs layer with P dopant and the Al/sub x/AsGa/sub 1-x/ layer forms horizontal P-N junctions with the N-type vertical regions. An N + region is formed on the solar cell backside by ion implantation of an N dopant followed by a pulse electron beam current of the implanted region.

44377 Semiconductor solar energy device. Coleman, M.G. (to Motorola Inc.). US Patent 4,070,689. 24 Jan 1978. Filed date 31 Dec 1975. 6p.

This disclosure relates to a semiconductor solar energy device which is of the PN-type and utilizes a dielectric anti-reflective coating on the side of the device that faces the sunlight. The fabrication techniques used in making this semiconductor device include the use of ion implantation to form doped or diffused regions in the device. One of the ion implanted regions located on the side of the device that is subjected to the sunlight is configured in order to permit metal ohmic contact to be made thereto without shorting through the doped region during sintering of the metal contacts to the semiconductor substrate. The dielectric anti-reflective coating, in one embodiment, is a composite of silicon dioxide and silicon nitride layers. The device is designed to permit solder contacts to be made to the P and N regions thereof without possibility of shorting to semiconductor regions of opposite type conductivity.

44378 Method of forming silicon solar energy cell having improved back contact. Lindmayer, J. (to Solarex Corp.). US Patent 4,056,879. 8 Nov 1977. Filed date 14 Jul 1976. 4p.

A silicon solar energy cell is described having a diffusant junction extending inwardly from one surface, an aluminum-silicon junction of the opposite polarity extending inwardly from the other surface, and a film of aluminum-oxygen-diffusant formed over the aluminum-silicon junction. The structure is formed by diffusing an unprotected wafer, coating the diffusant glass so formed on one side of the wafer with aluminum, and heating the wafer.

44379 Thin film photovoltaic diodes and method for making same. Kirkorian, E.; Crisp, M.J. (to General Dynamics Corp.). US Patent 4,057,476. 8 Nov 1977. Filed date 26 May 1976. 22p.

Photovoltaic diodes prepared by the methods of the invention include p-n (or n-p) heterojunction or homojunction diodes as well as Schottky barrier diodes where both elements of the diode comprise thin monocrystalline films of Pb/sub 1-x/Sn/sub x/Te or a thin monocrystalline film of Pb/sub 1-x/Sn/sub x/Te and an appropriate thin barrier metal film. Such a monocrystalline Pb/sub 1-x/Sn/sub x/Te film is sputter deposited, has a composition Pb/sub 1-x/Sn/sub x/Te which may range from x = 0.0 to about x = 0.3 and, consequently, can be preselected to have a photovoltaic response with response cutoff wavelengths ranging from about 6.0 μm to about 25 μm at 77°K. The first film is sputter deposited under controlled conditions in accordance with the present method, including at low pressure of selected gas and at selected substrate temperature and film growth rate conditions with or without substrate temperature and film growth rate condition with or without substrate bias voltage of from about +30 volts to about -30 volts, so as to control the composition and stoichiometry of the resulting film as well as its carrier type, carrier concentration and Hall mobility to provide selected electro-optical properties. Thereupon a second film is deposited, which is either a film of composition Pb/sub 1-x_1/Sn/sub x_1/Te where x_1 may range from 0.0 to about 0.3, in which case this film is deposited directly upon the first film, or a film of thin barrier metal which may be deposited on the first film. The thin barrier metal film is utilized in preparing Schottky type diodes and the film may be lead, indium or the like. The present method provides in a very economical manner at moderate conditions high sensitivity photovoltaic diodes utilizing PbSnTe films requiring no costly and time consuming post-deposition treatment such as annealing.

44380 Solar panel. Lindmayer, J. (to Solarex Corp.). US Patent 4,057,439. 8 Nov 1977. Filed date 25 Aug 1976. 4p.

A solar panel is described having solar cells adhered to the base surface thereof by a single component, room temperature vulcanizing silicone resin and encapsulated in a multicomponent silicone resin with desirable optical properties.

44381 Solar cell shingle. Forestieri, A.F.; Ratajczak, A.F.; Sidorak, L.G. (to National Aeronautics and Space Administration). US Patent 4,040,867. 9 Aug 1977. Filed date 24 Aug 1976. 4p.

A solar cell shingle may be made of an array of solar cells on a lower portion of a substantially rectangular shingle substrate made of fiberglass cloth or the like. The solar cells may be encapsulated in flourinated ethylene propylene (FEP) or some other weatherproof translucent or transparent encapsulant to form a combined electrical module and a roof shingle. The interconnected solar cells are connected to connectors at the edge of the substrate through a connection to a common electrical bus or busses. An overlap area is arranged to receive the overlap of a cooperating similar shingle so that the cell portion of the cooperating shingle may overlie the overlap area of the roof shingle. Accordingly the same shingle serves the double function of an ordinary roof shingle which may be applied in the usual way and an array of cooperating solar cells from which electrical energy may be collected.

44382 Solar cell and method of production. Cuomo, J.J.; DiStefano, T.H.; Rosenberg, R. (to International Business Machines Corp., Armonk, N.Y. (USA)). German(FRG) Patent 2,702,860/A/. 4 Aug 1977. 23p. (In German).

To improve solar cell yields, e.g. from low-quality silicon monocrystals to polycrystals, it is proposed to dope the crystal defects in order to prevent premature carrier recombination. In the case of epitaxy of a high-n-doped zone of about 1 μm on p-doped, gas-etched substrate, the defects projecting into the p-zone form depletion zones. In these depletion zones, excess holes within the p zone are rejected from the neighbourhood of the boundary region where recombination might take place. The strongly doped defects act as collector fingers for electrons in the p-doped zone.

44383 Solar cell made of semiconductor material, with method of production. Gibbons, J.F. German(FRG) Patent 2,703,430/A/. 4 Aug 1977. 37p. (In German).

When fabricating solar cells from cheaply producible materials, transport of charge carriers is accelerated by drift fields in the activated region to make up for their shorter lifetimes. These drift fields are generated by a gradient of doping density. The invention is described by a number of examples of application with exact data.

44384 Device for converting of radiation into electric power. Lebrun, J. (to Philips Gloeilampenfabrieken N.V., Eindhoven (Netherlands)). German(FRG) Patent 1,807,818/B/. 30 Sep 1976. 6p. (In German).

The equipment consists of a battery of radiation-sensitive semiconductor elements, which are electrically connected and are mounted on a support. This support is provided with a metal surface on at least one side, preferably silver-plated. The support must be capable of being bent, so that the elements which react to electromagnetic or particle radiation are largely independent of each other. Therefore the insulating support should consist of a material (e.g. polyimide resin) which has unchanged properties over a range of -70 to +70°C. The metal surface parts have cutouts in them. Tongues are made of these cutout parts, which provide the connection between the metal surface and the radiation sensitive elements. Further claims and examples illustrate possible variations of the arrangement as well as the method and advantages of manufacture of the equipment according to the invention compared with well-known forms of construction.

44385 Solar converter. Butler, D.M. US Patent 4,075,034. [nd]. Filed date 8 Feb 1977. 4p.

A solar energy converter is described for producing variable amplitude alternating current waveforms directly from solar energy including a photo-voltaic cell bank array, formed of a plurality of weighted photo-voltaic segments, a multi-sided, high speed, rotating, light concentrating, concave mirror and a servo means for tracking the sun. Rotation of the mirror past the weighted segments of the photo-voltaic bank produces instantaneous outputs which are proportional to the number of cells scanned in each segment. By suitable arrangement of the photo-voltaic segments, a simulated ac waveform is produced.

BIOMASS PRODUCTION AND CONVERSION

44386 (COO—2952-16) **Dirt feedlot residue experiments. Quarterly progress report, October 1, 1977—November 30, 1977.** Turk, M. (United Technologies Corp., Windsor Locks, Conn. (USA). Hamilton Standard Div.). 1977. Contract EY-76-C-02-2952. 77p. Dep. NTIS, MF A01.

Portions of document are illegible.

Progress is reported in development of a mobile fermentation system at the Monfort feedlot. Continued use was made of aged pen 307 residue at a nominal loading rate of 0.25 pounds volatile solids/ft^3/day along with a 10-day retention time and an operating temperature of 57°C for the purpose of establishing comparative yields. The ten-day running average of specific methane yield increased to an indicated yield of 3.0 ft^3 CH_4/No. volatile solids representing approximately 75 percent of that obtained from the fresh residue. During this entire period no attempts at controlling total volatile acid concentration were made. Preliminary investigation of the centrifuge capture efficiency was begun. (JGB)

44387 (COO—4070-4) **Background information for the economic assessment of solvent fermentation processes.** (Pennsylvania Univ., Philadelphia (USA)). Jan 1977. Contract EY-76-S-02-4070. 30p. Dep. NTIS, PC A03/MF A01.

An economic assessment of solvent fermentation processes was made. The question of whether or not the increased costs for petrochemical raw materials are sufficiently high now (or their projected costs in the 1980's), such that certain chemicals could be produced commercially from a cheaper raw material, say cellulosics, via various fermentation routes is considered. Specific examples under consideratin are n-butanol, propionic acid, and acetic acid. A qualitative approach was developed, based on major cost factors of alternative routes for making such projections. The technique described can be made as quantitative as desired by applying accepted engineering design and economic analysis principles to the complex, interacting factors that are involved. Some broad qualitative conclusions are made.

44388 (LBL—5962) **Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature.** Carroad, P.A.; Wilke, C.R. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Dec 1976. Contract W-7405-ENG-48. 27p. (CONF-760164—1). Dep. NTIS, PC A03/MF A01.

From Symposium on enzymes in the food processing industry; Davis, CA, USA (14 Jan 1976).

Bioconversion of food processing wastes is receiving increased attention with the realization that waste components represent an available and utilizable resource for conversion to useful products. Liquid wastes are characterized as dilute streams containing sugars, starches, proteins, and fats. Solid wastes are generally cellulosic, but may contain other biopolymers. The greatest potential for economic bioconversion is represented by processes to convert cellulose to glucose, glucose to alcohol and protein, starch to invert sugar, and dilute waste streams to methane by anaerobic digestion. Microbial or enzymatic processes to accomplish these conversions are described.

44389 Utilization of solar energy through photosynthesis and artificial water photolysis. Broda, E. (Vienna Univ. (Austria)). pp 117-131 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 24: Biokonversion. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The plants build up organic matter with a carbon content of the order of 10^{11} t/year by means of photochemistry. Energy farming for the production of liquid or gaseous fuel is discussed. Yet the abiotic photolysis of water with production of hydrogen is preferable. By means of synthetic, asymmetric, photochemically active membranes the primary products of water photolysis could be spatially separated so that their recombination is prevented.

PHOTOCHEMICAL AND THERMOCHEMICAL CONVERSION

44390 (TID—27802) **Evaluation of the commercial feasibility of hydrogen production by the solar photoelectrolysis of water. Task I interim report.** Schwerzel, R.E.; Brooman, E.W.; Craig, R.A.; Wood, V.E. (Battelle Columbus Labs., Ohio (USA)). 16 May 1977. Contract W-7405-ENG-92-095. 128p. Dep. NTIS, PC A07/MF A01.

Photoelectrolysis is a recently-discovered technique which utilizes the photoelectric properties of certain semiconducting materials for the conversion of light energy into either electrical energy or the chemical potential energy of high-energy products, such as hydrogen. The research performed during Task I of this project has sought to address the vexing dichotomy of materials properties which appears to be the major impediment to the successful development of methods for hydrogen production by means of the solar photoelectrolysis of water. Those potentially useful photocatalytic semiconducting materials reported to date, which absorb sunlight strongly, tend to be unstable with respect to corrosion or dissolution under photoelectrolytic conditions, while those materials which have been found to be intrinsically stable also tend to be transparent, or nearly so, to most of the solar spectrum. Their efficiency of solar energy utilization is therefore disappointingly low. The need, then, is for photocatalytic materials which are both stable and highly colored. Toward this end, the research performed during Task I has been directed toward (a) developing a theoretical description of the semiconductor properties required for optimal photoelectrolysis efficiency, and (b) identifying the factors governing the selection of redox electrolytes which might be used either to stabilize the semiconductor electrodes or to suppress the evolution of oxygen (which

could be troublesome in certain cell configurations). Because this project is particularly concerned with the eventual commercial feasibility of photoelectrolysis, preliminary consideration has been given to the possibility of utilizing the redox electrolytes present in ambient water supplies for this purpose. An effort has also been made to bring together, in a unified and self-consistent manner, those relevant results published elsewhere which have been couched in a variety of formats and sign conventions.

44391 Photochemical aspects of solar energy conversion. Vogler, A. (Regensburg Univ. (Germany, F.R.). Inst. fuer Chemie). pp 175-182 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 24: Biokonversion. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

As an alternative to the typical methods of solar energy conversion one can consider photo-chemical reactions. In this case certain chemicals are converted by means of light absorption to other chemicals with higher energy content. The higher energy chemicals must be stable under normal conditions, but under certain conditions they can return to the lower energy original chemicals upon release of electric or thermal energy. The particular advantages of these methods are that the solar energy can be stored for an arbitrarily long period of time and that the storage takes place at low light intensity levels.

PHOTOVOLTAIC POWER PLANTS

44392 (N—77-33600) **Solar power satellite. Concept evaluation. Activities report. Volume 2. Detailed report. Progress report, July 1976—June 1977.** (National Aeronautics and Space Administration, Houston, Tex. (USA). Lyndon B. Johnson Space Center). Jun 1977. 1166p. (NASA-TM—74942; JSC—12973(Vol.2)). NTIS PC A99/MF A01.

Comparative data are presented among various design approaches to thermal engine and photovoltaic SPS (Solar Power System) concepts, to provide criteria for selecting the most promising systems for more detailed definition. The major areas of the SPS system to be examined include solar cells, microwave power transmission, transportation, structure, rectenna, energy payback, resources, and environmental issues.

44393 (N—77-33607) **ATS-6 solar cell experiment/improvement. Final report, 1 January—31 December 1976.** Goldhammer, L.J. (Hughes Aircraft Co., El Segundo, Calif. (USA)). 31 Jan 1977. Contract NAS5-22873. 47p. (NASA-CR—152609). NTIS PC A03/MF A01.

ATS 6 solar cell flight experiment data through 2 years of synchronous orbit operation are presented. Comparisons are made of the performances of the 13 different types of solar cell/cover configurations, including new cover processes and materials, and the COMSAT violet cell. These performances are also compared to the performances of the LES 6 solar cell experiment, the ATS 6 main solar arrays, and the Hughes Aircraft Company solar arrays, and to laboratory spectrum electron irradiations. It was found that the cells of the ATS 6 experiment generally performed as expected through 6 to 9 months in orbit, but that at 2 years they were more severely degraded than expected.

SOLAR THERMAL POWER PLANTS

REFER ALSO TO CITATION(S) 44392, 44555

44394 (CONF-761220—, pp 395) **Simultaneous generation of heat and electricity.** Saiy, M. (Arya-Mehr Univ. of Tech., Teheran). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44395 Power plant. Warren, G.B. US Patent 4,069,674. 24 Jan 1978. Filed date 14 Jan 1977. 6p.

A steam turbine-generator power plant is described wherein solar energy is used to preheat feedwater to a steam generator. Two parallel feedwater supply branches are proposed for preheating the feedwater upstream from the steam generator. A first preheater branch utilizes extraction steam from the steam turbine for preheating feedwater and is called an extraction branch. A second preheater branch utilizes solar energy for preheating feedwater and is called a solar branch. The two branches are joined upstream from the steam generator and the proportion of flow from each branch is based on the temperature difference between the extraction branch and the solar branch. A variable speed pump is used to pump feedwater from the solar branch at a rate proportional to the temperature difference between the two branches.

44396 Gas turbine cycles for effective use of solar energy. Bammert, K.; Krapp, R.; Reiter, U. (Technische Univ. Hannover (Germany, F.R.). Inst. fuer Stroemungsmaschinen). *Atomkernenergie;* **31**: No. 1, 1-3(1978). (In German).

From 10. world energy conference. Availability and rational uses of energy resources; Istanbul, Turkey (19 - 24 Sep 1977).

Because of its characteristics the closed-cycle gas turbine is suitable for a variety of applications. There is a free choice as to working medium, primary energy and location of the plant. With an appropriate layout it can be used with good efficiency in a capacity range of between 500 kW and 1,000 MW and above. This means that it is ideal for use in solar energy plants, particularly in view of the fact that cooling water can be dispensed with because dry cooling is easily realisable. Furthermore, there is an enormous development potential of the gas turbine as compared with steam turbine plants, since with progressive materials higher turbine inlet temperatures and thus higher plant efficiencies can be achieved.

44397 Method for comparing solar energy power systems for developing countries. Fry, H.; Barthelmess, W.; Berndorfer, K. (Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (Germany, F.R.). Unternehmensbereich Raumfahrt). pp 501-514 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 31: Energietechnologien fuer Entwicklungslaender. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977).

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

A summary of methods used to compare solar-thermal power systems in the range up to 10 MWe is given. The significance of local parameters is explained and emphasized. Methods of determining hardware costs are briefly described - particularly for collectors; also the methods of determining energy output and energy costs. Different systems can be usefully compared only on the basis of a value analysis; an example is given. Criteria and weighting depend on local conditions.

CENTRAL RECEIVER

44398 (CONF-761220—, pp 231-232) **Heliostat structural stability as a function of solat heating and ambient temperature changes.** Cutting, F.M. (Honeywell Inc., St. Petersburg, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The proposed ERDA one megawatt solar test facility to be built near Albuquerque, New Mexico is mentioned. A qualitative summary of the effects of paint, insulation, and solar shielding on thermal expansion and/or distortion of the heliostats is presented. The effect of these design options are evaluated for several pynamic inputs. (MHR)

TOTAL ENERGY AND HYBRID SYSTEMS

REFER ALSO TO CITATION(S) 44488

44399 Solar powered gas generation. Brown, H.D. US Patent 4,080,271. 21 Mar 1978. Filed date 6 Jun 1977. 4p.

This invention relates to the utilization of solar energy by means of a reflector, a boiler and a turbogenerator whereby solar heat is concentrated and electric power is produced, utilization of the exhaust heat from the power cycle in the distillation of sea water, and utilization of the electric power in a plurality of electrolytic cells whereby hydrogen and oxygen are extracted from the distilled water and hydrogen and chlorine are extracted from the sea water.

OCEAN THERMAL GRADIENT POWER PLANTS

44400 (CONF-770331—, pp VI.110) **Reply to comments on seawater side enhancement for OTEC heat exchangers.** Sabin, C.M.; Poppendiek, H.F. (Geoscience Ltd., Solana Beach, CA). Jul 1977.

From 4. ocean thermal energy conversion conference; New Orleans, LA, USA (22 Mar 1977).

In Proceedings of the fourth annual conference on ocean thermal energy conversion.

SOLAR RADIATION UTILIZATION

REFER ALSO TO CITATION(S) 44541

44401 (CONF-761220—, pp 19-20) **Solar aesthetics and incentives.** Cook, J. (Arizona State Univ., Tempe). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The architectural aspects of solar buildings are discussed in terms of life styles and incentives. (MHR)

SPACE HEATING AND COOLING

REFER ALSO TO CITATION(S) 44347, 44465, 44487, 44496, 44541, 44885, 44923, 44937

44402 (CONF-761220—) **Solar cooling and heating: a national forum. Proceedings of condensed papers.** Veziroglu, T.N. (ed.). (Miami Univ., Coral Gables, Fla. (USA). Clean Energy Research Inst.). 1976. 479p. Dep. NTIS, PC A18/MF A01.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

One hundred and three papers and lectures are included in condensed format. Two appeared previously as Conf-761220--2 and Conf-761220--1. Seventeen of these papers are listed by title. Separate abstracts were prepared for 84 papers and eleven of these were selected for EAPA. (MHR)

44403 (CONF-761220—, pp 5-8) **Solarized office: architectural implications in office planning and design, utilizing direct solar gain by means of 'solar modulators', 'transparent insulation', and 'solar storage tiles'.** Andrejko, D.A. (Massachusetts Inst. of Tech., Cambridge). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The utilization of direct solar gain in small office architecture through the application of 3 new building components is discussed. The building components are: solar ceiling tiles, a lightweight phase change material encapsulated in a polymer concrete; transparent insulation, 4 air gaps formed by 5 polymer layers give an overall U-value of 0.20 Btu/hr ft^2 F, with a transparency of 76%; and solar modulators, specialized horizontal louver system which reflects received insolation to the darkened solar ceiling tiles, while maintaining views to the exterior. (MHR)

44404 (CONF-761220—, pp 9-12) **Modular solar house.** Jenkins, P.E.; Young, M.; Duthu, D. (Texas A and M Univ., College Station). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The results of the analysis used in the design of two scaled modular solar houses are presented. The house design characteristics and overall system concepts are described. The basic simulation procedures used to develop the system design parameters are mentioned. The information gained from the simulation analysis is used to develop a design of the total solar driven heating and cooling systems for the model houses. (MHR)

44405 (CONF-761220—, pp 15-16) **Suntrap insolator/insulator possible application to walls and roofs of schools.** Cobb, J.C. (Univ. of Colorado, Denver). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The experimental SUNTRAP Insolator/Insulator consists of louvers about 8 inches wide and 2 inches thick, made of insulating material (polyurethane foam). They were shaped with two cylindrical parabolic surfaces and two plane surfaces and coated with a shiny reflecting surface (aluminum foil). On the under side, the louvers were attached to a thin plastic sheet (mylar), so that when the controlling cord was pulled, as in a venetian blind, the louvers open to the desired angle, pivoting around their attached ends. (MHR)

44406 (CONF-761220—, pp 17) **Significance of hybrid solar architecture.** Bowen, A. (Univ. of Miami, Coral Gables, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44407 (CONF-761220—, pp 109) **Solar heating and cooling of buildings in Greece with special reference to schools.** Stambolis, C. (Faculty of Environmental Studies, London). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44408 (CONF-761220—, pp 111-112) **Ideal greenhouse.** Longhetto, A.T. (Patentes Simplex Aerotermicas, Madrid). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Likely plastic materials were studied that would permit the passage of solar radiation, and at the same time acting as solar collectors, through which the fluid will circulate. This fluid is to be: a chemically treated selective fluid for a greater absorption of solar radiation; a cold fluid, to preserve the inside from external heat; and a colorable fluid, to condition the light that is received inside. (MHR)

44409 (CONF-761220—, pp 113-114) **Technical economical study of the solar house situated in Cuarte De Huerva (Zaragoza).** Longhetto, A.T. (Patentes Simplex Aerotermicas, Madrid). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The first solar building in Spain is described briefly. It is a 5-story 20-apartment building. The apartments average 98 m^2 each. There are 225 m^2 of solar panels. The installation has been functioning for three years, with a 40% saving in heating fuel in cold months, and of 70% in hot water annually. The system is reversible for cooling. (MHR)

44410 (CONF-761220—, pp 127) **Solar energy research facility at the University of Texas at Arlington.** Lowery, G.W.; Koltick, J.M. Jr. (Univ. of Texas, Arlington). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44411 (CONF-761220—, pp 129-133) **Brighton Polytechnic Integrated Solar Dwelling (ISD).** McVeigh, J.C. (Brighton Polytechnic, London). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The Brighton ISD project is a self-sufficient dwelling based on a combination of practical experience of the various systems—solar, wind, water, food, and sanitation—and theoretical modeling studies. There are 12 m^2 of solar collectors. The experimental program for 1976-78 and a floor plan are given. (MHR)

44412 (CONF-761220—, pp 135-136) **University of Louisville Dual Solar Energy Research Center.** Murray, T.M.; Calhoun, J.H. (Univ. of Louisville, KY). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The administration building for the astronomy observatory for the University of Louisville will also function as a solar energy proof-of-concept complex. The building will have 1850 ft^2 of floor area. Solar energy will be collected by two different types of water collectors of 500 ft^2 each. The heated water will be stored in two 3000 gallon tanks in the basement. An absorption A/C system will be added. The instrumentation is described. (MHR)

44413 (CONF-761220—, pp 137-145) **Performance of the UNL-LES solar-heat pump demonstration home.** Bourne, R.C. (Univ. of Nebraska, Lincoln). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The performance of the UNL-LES demonstration home from November 2, 1975 to October 1, 1976 is summarized. The house is unique in its uses of a solar-assisted heat pump with thermal storage on the "condenser side" during the heating mode. The advantages of this configuration are listed. Measured heat pump COP vs (storage temperature-heat pump intake temperature) and storage temperature recovery capability as a function of outdoor temperature and solar input are shown. (MHR)

44414 (CONF-761220—, pp 147-148) **Solar energy for the hotel/motel industry.** Ainscough, T.L. (Collaborative Interface Designs Inc., Charlotte, NC). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

It is suggested that solar energy can play an important role in the hotel/motel industry, particularly in new facilities where conservation techniques can be utilized. It is also suggested that many existing facilities, both large and small, could be retrofitted with solar equipment with a reasonable pay back period. (LS)

44415 (CONF-761220—, pp 157-160) **Upton Community Multi-Purpose Center, Baltimore, Maryland.** Parker, A.J. Jr.; Hedden, R.E. (Mueller Associates, Inc., Baltimore, Maryland). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The 17,000 square foot building houses a daycare and recreation facility. The core of the facility is a steel framed gymnasium with the single plane solar collector integrated into the single pitch roof structure. A heat pump distribution system is employed in conjunction with additional insulation and recessed, double-glazed windows and air-lock entry to improve the thermal performance of the building. The hallway incorporates thick masonry walls and is covered with skylights to provide light and passive solar heating. (MHR)

44416 (CONF-761220—, pp 165) **Solar-assisted heat pump for northern latitudes.** Swartman, R.K. (Univ. of Western Ontario, London, Canada). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44417 (CONF-761220—, pp 171-175) **Use of solar energy for space heating in individual dwellings in Kansas.** Pytlinski, J.T.; Eckhoff, N.D. (Kansas State Univ., Manhattan). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Four solar heated dwellings in Kansas are shown and described. The energy available daily from solar for an average house in Kansas for different collector area is shown. (MHR)

44418 (CONF-761220—, pp 191-194) **Solar energy system of the Institute of Molecular Biology, Salzburg of the Austrian Academy of Science.** Viehboeck, F.P.; Braun, P.; Dobrozemsky, R.; Hammer, D.; Reudenauer, F. (Univ. of Tech., Vienna). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A schematic diagram of the integrated solar energy installation (ISEI) is shown. Water-antifreeze medium is used. A block diagram of the data handling system is shown. (MHR)

44419 (CONF-761220—, pp 195-196) **Wind-solar coupled domestic heating system.** Jensen, B.H.; Ciletti, M.D. (Univ. of Colorado, Colorado Springs). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44420 (CONF-761220—, pp 229-230) **Operating results: a competitively priced home heated by concentrating solar collectors.** Kusianovich, J. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A home in Albuquerque is heated by concentrating tracking solar collectors. These collectors consist of moveable reflectors which track the sun across the sky and focus its rays on fixed copper pipes through which water is pumped. The hot water is stored in two 1,000 gallon tanks and is delivered via conventional base board units. The control system, auxiliary heating, and performance are discussed. (MHR)

44421 (CONF-761220—, pp 245-252) **Performance tests of an improved three ton air conditioner for the Honeywell Mobile Solar Research Facility.** Barber, R.E. (Barber-Nichols Engineer Co., Arvada, CO). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Barber-Nichols developed a solar heated, Rankine cycle power cooling system for the Honeywell Mobile Solar Research Van as a demonstration of a residential solar heating and cooling system. This system has been touring the country for approximately three years, using 625 ft^2 of flat plate collectors, an Arkla absorption system, and the Barber-Nichols Rankine cycle powered vapor cycle cooling system. The performance of an improved unit that was installed in the van in January 1976 is summarized. (MHR)

44422 (CONF-761220—, pp 259-261) **Solar cooling of a 25,000 square foot office building.** Diamond, S.; Packard, C.; San Martin, R.L.; Shaw, H.; Stevens, W. (New Mexico State Univ., Las Cruces). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A schematic of the solar heating and cooling system is shown. A block diagram of the data acquisition system is given. (MHR)

44423 (CONF-761220—, pp 267-268) **Solar cooling, Florida welcome station.** Beach, C.D.; Hancock, O.G.; Lowery, G.W. (Florida Solar Energy Center, Cape Canaveral, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The solar heating and cooling system to be retrofitted into the Florida Welcome Station on Interstate 95 north of Jacksonville is described briefly. Key components of the system are the Arkla WFB-300 water chiller, a field of 270 Northrup concentrating collectors, a 6000-gallon hot water storage tank, a 6000-tallon chilled water storage tank, and a water cooling tower to provide condenser cooling. The system will be fully instrumented. (MHR)

44424 (CONF-761220—, pp 269-270) **Solar-powered dehumidification.** Arnas, O.A. (Louisiana State Univ., Baton Rouge); Ashton, J.L.; Rewerts, L.J. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The application of solar energy to the dehumidification of a typical family dwelling in the humid and hot environments along the coastline of the Gulf of Mexico is explored. Cooling below the dew point using a lithium bromide absorption air conditioner is considered to be the best suitable method for use with solar energy. (MHR)

44425 (CONF-761220—, pp 271-281) **Summer night cooling in Saudia Arabia.** Sayigh, A.A.M. (Univ. of Riyadh, Saudia Arabia). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Various means of cooling are studied including sensible cooling, dehumidification, and humidification processes. Here emphasis is placed on sensible cooling in using nocturnal radiative properties of the sky and black surfaces. (MHR)

44426 (CONF-761220—, pp 289-290) **Desiccant systems potential for cooling in humid climates.** Olsen, T.G. (Univ. of Miami, Coral Gables, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The use of desiccants in space cooling is discussed. The added disadvantage of using desiccants for an evaporative cooling system is considered. The advantage of using a system combining latent heat removal by a desiccant system and sensible heat removal by a solar driven absorption refrigeration system is described. (MHR)

44427 (CONF-761220—, pp 291-292) **Solar air conditioning for a school in Dade County, Florida.** Olsen, T.G. (Univ. of Miami, Coral Gables, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The design philosophy, environmental characteristics, and cooling systems are discussed for a typical school where the cooling season is at least nine months of the year. (MHR)

44428 (CONF-761220—, pp 295-297) **Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC).** Allen, R.W.; Anand, D.K.; Egrican, A.N. (Univ. of Maryland, College Park). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A solar powered RC/VCC is studied with the view of developing flexible calculation models representing the thermal performance characteristics of a variety of air conditioning machines. The incorporation of heat transfer equations as well as thermodynamic variables in the simulation of a solar powered cycle is described. (MHR)

44429 (CONF-761220—, pp 301-303) **Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC).** Johnson, A.I.; Nwagha, H.N. (Univ. of Western Ontario, London). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

DYNSYS, an acronym for DYNAMIC SYSTEMS SIMULATOR, a modular problem oriented executive program, is described briefly. (MHR)

44430 (CONF-761220—, pp 305-307) **Computer simulation and system optimization of a solar powered absorption cooling process.** Bessler, W.; Shen, C.N. (Rensselaer Polytechnic Inst., Troy, NY). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Choosing a representative absorbent-refrigerant pair and determining areas for evaluation of the system to focus on are discussed. The parameters of flow rates of refrigerant and absorbent, heat exchanger effectiveness, and operating temperatures of the generator, condenser, absorber, and evaporator were studied. These parameters are varied over applicable operating ranges in order to find their effect on system COP, to study system sensitivity, and to optimize system performance. (MHR)

44431 (CONF-761220—, pp 309-314) **Simulation of a solar-assisted and open cycle cooling system using air as the transport medium.** Gamble, R. (Ohio State Univ., Columbus). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A model of a solar-driven and air-transport conditioning system was formulated. The operating ranges, the constraints of the system components, and the thermal efficiency of the system were identified. Several operating curves are shown and the performance of this machine is compared with other available solar-assisted units. The feasibility of the cooling system is discussed with various operating and ambient temperature ranges. (MHR)

44432 (CONF-761220—, pp 315-317) **Comparison of simulated solar cooling systems in Saudia Arabia.** Jenks, R.L. (Univ. of Petroleum and Minerals, Dhahran, Saudi Arabia); Jones, R.W.; Kremheller, A. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A study of solar-powered space cooling of buildings in the Gulf region of Saudi Arabia is discussed. The study is a simulation by digital computer of a building whose interior space is cooled by a lithium bromide-water absorption air-conditioner powered by hot water supplied by a flat-plate solar collector. The simulation is based on the input of hourly insolation and temperature data measured at Dhahran, Saudi Arabia. (MHR)

44433 (CONF-761220—, pp 319) **Simplified model for the solar collector: load interaction.** Yuill, G.K.; Chant, R.E. (Univ. of Manitoba, Winnipeg). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44434 (CONF-761220—, pp 321-323) **Digital processor-based control for a solar monitoring and test station.** Passella, J.R. (Motorola Communications Group, Schaumburg, IL); Alexander, C.K. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The basic layout is presented of a unit for systems testing, a numerical processor based control, which will work with both monitoring and testing stations. A block diagram of the system is shown. The choice of processor is discussed briefly. (MHR)

44435 (CONF-761220—, pp 325-328) **Design and stability of master control systems for energy independent homes.** Latif, F.A.; Alexander, C.K. (Youngstown State Univ., OH). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A system is presented that will be able to control most of the possible inputs and outputs of a home using solar energy to meet any combination of the following functions; space heat, domestic hot water, space cooling, and electricity. The system is discussed for either a water-based or an air-based type. The use of wind energy or a photovoltaic circuit is mentioned. (MHR)

44436 (CONF-761220—, pp 329-336) **Solar energy coupled networks.** Marks, J.R.; Lonski, P.D.; Casey, K.M.; Madonna, L.A. (Widener Coll., Chester, PA). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The current development of solar energy absorbing systems is predicated upon the appropriate coupling of networks. These networks may be thought of as phase spaces. In this problem two phase spaces are coupled through the use of a transduction element which is the turbine. Mathematical model of a matrix character for the phase spaces are shown to be readily constructed by assigning every piece of equipment a number and calling that piece of equipment a network mode.

44437 (CONF-761220—, pp 341-342) **Microprocessor instrumentation and control of the University of Louisville's Dual Solar Energy Research Center.** Calhoun, J.H.; Murray, T.M. Jr. (Univ. of Louisville, KY). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The University of Louisville's astronomy observatory's administration building will also function as a solar energy proof-of-concept complex. The building will have 1850 ft^2 of floor space. Two different types of water collectors of 500 ft^2 each will collect solar energy. The heated water will be stored in two 3000 gallon tanks in the basement. There will be multiple methods to control the components of the system to increase the system's overall efficiency and these components will be under direct control of a microprocessor system. The control system is described. (MHR)

44438 (CONF-761220—, pp 459-460) **Labor costs associated with solar equipment installation for commercial buildings.** Parker, A.J. Jr.; Hedden, R.E. (Mueller Associates, Inc., Baltimore). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44439 (CONF-761220—, pp 363-364) **Alternate working fluids for solar air conditioning applications.** Evans, R.D.; Beck, J.K. (Florida Technological Univ., Orlando). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A systematic approach for evaluating refrigerant-absorbent fluid pairs for solar powered absorption air conditioning applications is presented. An experimental investigation of sixteen different fluid pair combinations was carried out in order to determine their suitability as the working fluid in a solar powered absorption cycle air conditioner. (MHR)

44440 (DOE/NASA/CR—150553) **Solar heating system for recreation building at Scattergood School.** Heins, C.F. (Scattergood School, West Branch, Iowa (USA)). 3 Jan 1978. Contract EX-76-C-01-2386. 136p. Dep. NTIS, MF A01.

Portions of document are illegible.

This project was initiated in May 1976 and was completed in June 1977. A six-month acceptance-testing period followed during which time a number of minor modifications and corrections were made to improve system performance and versatility. This Final Report describes in considerable detail the solar heating facility and the project involved in its construction. As such, it has both detailed drawings of the completed system and a section that discusses the bottlenecks that were encountered along the way.

44441 (SOLAR/0004—78/18) **User's guide to the monthly performance report of the National Solar Data Program.** (International Business Machines Corp., Huntsville, Ala. (USA)). 28 Feb 1978. Contract EG-77-C-01-4049. 32p. Dep. NTIS, PC A03/MF A01.

For each solar energy system demonstration site participating in the National Solar Data Program, a Monthly Performance Report is prepared. The purpose of the report is to assemble in convenient form pertinent information on the operation and status of the system for the reporting period. The report contains both an analysis of the system's performance for the month and computer printouts of associated data and performance factors. The Monthly Performance Report becomes the historical record of the performance of the system over the duration of the demonstration program. Although the data content of each report varies from site to site, all have the same general format. As an aid to understanding this format, its nomenclature, parameters, and various elements, this User's Guide contains background information about the National Solar Data Network collection and processing functions, including how the measurements are gathered, transmitted and eventually presented in a usable form for each report. An overview of the report and a detailed description of the various report forms are given.

44442 **Solar collector and heating and cooling system.** Saunders, N.B. US Patent 4,078,603. 14 Mar 1978. Filed date 9 Jul 1975. 10p.

The invention is directed to a solar heat control device for either transferring solar heat to, or diverting it away from a heat transfer fluid depending on the time of year. The solar heat control device is adapted to be used in a novel heating, cooling, lighting and ventilating system which is operable in one of two modes. In addition to the solar heat control device, the system also includes means for storing the heated fluid, heat radiation and absorption

means for transferring heat between the fluid and the interior of the structure in which the system is used, a heat exchanger, an air pump, a fluid pump and a valve control for selecting the operating mode.

44443 Solar heating system. Bette, J.A. (to Universal Construction Industries, Inc.). US Patent 4,076,013. 28 Feb 1978. Filed date 11 Mar 1976. 10p.

A solar heating system for a building consists of a stressed-skin roof structure which includes at least one layer formed of longitudinally extended channel-shaped beam members, wherein each beam member is generally U-shaped in cross-section and positioned with its open channel directed outwardly of the building. These beam members are placed side by side with their central bight portions lying in substantially the same plane. The open outwadly facing channels of the beams are closed to form a closed channel or air space which is heated from the sun. A heat storage bed is associated with the building and means are provided for selectively circulating air from the closed channels in the layer of beams to heat the storage bed and to return the air from the storage bed to the closed channel. The heat stored in the storage bed is selectively distributed to the interior of the building through a separate air circulating circuit.

44444 Process of and apparatus for solar heating and the like. Gellert, D.P. US Patent 4,074,704. 21 Feb 1978. Filed date 28 May 1976. 10p.

This disclosure is concerned with the collection and concentration of solar ray energy and the like through optimal use of prismatic and reflective concentration thereof.

44445 Heat pump assisted solar powered absorption system. Bahel, V.O.; Kuehner, R. (to Borg-Warner Corp.). US Patent 4,070,870. 31 Jan 1978. Filed date 4 Oct 1976. 3p.

An all-year heating and cooling system incorporates an absorption refrigeration machine using solar energy as a primary heat source and a compression cycle system for boosting the temperature of the heating medium supplied to the absorption machine generator. During the heating mode, the solar collector, may be replaced by the compression cycle system if insufficient solar energy is available to satisfy the demand for heating.

44446 Solar air conditioning system. Swanson, D.A. US Patent 4,069,971. 24 Jan 1978. Filed date 10 Nov 1975. 10p.

A building structure is provided with a conventional air conditioning unit and a solar energized air heater unit. Heated air is drawn from the solar unit and discharged into the structure in response to a thermostat. Means are provided for supplying heated air from the air conditioning unit when the supply from the solar unit is inadequate to maintain a predetermined minimum temperature. Radioscope means disconnect the solar unit from the system when available solar energy falls below a predetermined value. The structure may include a wall having air storage capacity therein for receiving and holding heated air from the solar unit, which air is subsequently delivered to the interior of the structure.

44447 Solar heating system. Jensen, R.N. (to National Aeronautics and Space Administration). US Patent 4,062,347. 13 Dec 1977. Filed date 24 Aug 1976. 6p.

A system is disclosed for using solar energy to heat the interior of a structure. The system utilizes a low-cost solar collector to heat a recirculating air mass which then flows through a series of interconnected ducts and passageways without the use of exterior fans or blowers. Heat is transferred from the air mass to the structure's interior and the air mass is then reheated.

44448 Solar heating system and operation thereof. Lof, G.O.G. US Patent 4,061,267. 6 Dec 1977. Filed date 18 Aug 1975. 8p.

A solar heating system, using a pebble bed as a heat storage, includes an auxiliary heater, providing heat for the system and/or for the pebble bed during times of low solar heat accumulation and during off-peak use loading of the public utility network system in the area of the solar heating system. A plurality of temperature sensors are provided in various levels of the pebble bed to determine the availability of stored heat and to actuate the auxiliary heating system according to heat requirements and to the time of day.

44449 Solar plant and large-scale store for office buildings. Operational experience confirms: 42 m^2 collector area and a 15 m^3 store save 6,800 l heating fuel oil annually. Mittermeier, F. *Mitteilungsbl. Dtsch. Ges. Sonnenenergie;* **2**: No. 5, 27-28(Sep 1977). (In German).

A solar energy plant is described which, together with a heat pump, covers about 50% of the energy used so far for space heating and hot water supply. Two 7,500 l water tanks serve as the energy store. The plant costs all in all DM 38,000.

44450 Europe's biggest solar house stands in Swabia. Hot water supply and space heating in 'Heggbach', a home for the disabled. Urbanek, A. *Mitteilungsbl. Dtsch. Ges. Sonnenenergie;* **2**: No. 5, 19-22(Sep 1977). (In German).

The construction of a rather big house is described, the energy supply of which is partly met by solar energy. The collector has an area of 920 m^2, with which some 600,000 kWh thermal energy for floor and water heating are generated. Architectural measures, such as insulation, use of special windows and walls, help to utilize energy efficiency.

44451 Solar energy utilization in multivalent heating systems. Baltrusch, H. *Inst. Klimatech. Zentralheiz.;* **32**: No. 1, 39-42(1977). (In German).

This final part of the report deals with multivalent heating systems in practice. A building consisting of prefabricated parts was equipped with a heating system of this type; convectors were used for central heating while the swimming pool was equipped with a floor heating. The functions of the system components are described: heat pump, solar collector system, oil-fired heating boiler, automatic control. The capital investments for a multivalent heating system are higher than with an oil-fired heating, but these costs are made up for by considerable savings in the operating costs. Solar energy utilisation in solar heating systems yields the following positive results: energy savings, economy, no environmental pollution, comfort, safety.

44452 Big firms, too, back solar energy. Successful meeting of the Arbeitsgemeinschaft Solarenergie. Bierhals, R. (Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Karlsruhe (Germany, F.R.). Inst. fuer Systemtechnik und Innovationsforschung). *Sanit. - Heizungstech.;* **42**: No. 4, 347-349(1977). (In German).

From Lecture meeting on solar energy - applications, systems, experience; Essen, Germany, F.R. (4 Feb 1977).

A report on the technical meeting of the 'Arbeitsgemeinschaft Solarenergie' on the occasion of the German building exhibition in Essen is given. Technical state of collector development in the FRG, materials, service life, economy, and possible development of piece costs in connection with manufacture on an industrial scale are discussed. The lack of long-term experience prevents increased application of solar technology.

44453 Greenhouseheating with sun-energy. Zabeltitz, C. von; Damrath, J. (Technische Univ. Hannover (Germany, F.R.). Inst. fuer Technik in Gartenbau und Landwirtschaft). pp 243-251 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 25: Landwirtschaftliche Nutzung von Sonnenenergie. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Significant quantities of fossil fuels are consumed annually for the heating of greenhouses. A large share of this energy consumption can be reduced, if solar radiation, upon conversion to heat, is used more extensively for heating. Several possibilities for solar energy utilization are described. In addition the basic operation details of a solar test installation in Hannover is presented.

44454 Solar energy system for greenhouses. Raimann, B. (Allenspach und Co. A.G., Wangen (Switzerland)). pp 263-270 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 25. Landwirtschaftliche Nutzung von Sonnenenergie. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Greenhouses need large quantities of energy. About 75 to 80% of the annual energy needs occur during night hours. Moreover, under direct solar insolation many plants require shading to prevent an undesired excess of the room temperature. It was obvious to develop a system which collects the daily energy surplus for storage and nighttime use. In the following contribution a solar energy system with multiple uses shall be introduced.

44455 Residential solar demonstration program of the U.S. Department of Housing and Urban Development. Engel, D. pp 417-431 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 30: Markteinfuehrung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977).

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

As part of the overall National Solar Energy Program, the Residential Demonstration Program, managed by the U.S. Department of Housing and Urban Development, addresses a number of issues involved in developing a residential market for solar energy including costs, technical performance, public acceptance and institutional barrier. To date, over 5,000 units in the demonstration are being constructed or retrofited with solar systems.

AGRICULTURAL AND INDUSTRIAL PROCESS HEAT

44456 (CONF-761220—, pp 177-182) **System approach to determine an optimal system for supplying industrial process hot water**

using solar energy. Macala, G.A.; Alexander, C.K. (Youngtown State Univ., OH). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The systems approach was used to determine an optimal systems using flat plate collectors. An aluminum extrusion company's anodizing line was used as the model requiring the energy. Modeling using data for northeastern Ohio, was done on the computer and allowed cost optimization of the system. The results are displayed graphically. (MHR)

44457 (CONF-761220—, pp 189-190) **Process water heating by solar augmentation for the textile industry.** Hester, J.C.; Beard, J.N. Jr.; Harnett, R.M.; Robinson, G.F. (Clemson Univ., SC). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The reported study focuses upon need assessment, concept development, and economic viability determination for hot process water production. (MHR)

44458 Possibilities of using solar energy in dryers for agricultural products. Dernedde, W.; Peters, H. (Forschungsanstalt fuer Landwirtschaft, Braunschweig (Germany, F.R.). Inst. fuer Landmaschinenforschung). pp 197-205 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 25: Landwirtschaftliche Nutzung von Sonnenenergie. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Large quantities of energy, mainly in the form of oil are needed for the drying of agricultural products like hay, grain and corn in the present time. Because of the high moisture contents and the large quantities of the products to be dried, in the case of compensation of oil by solar energy high investments in collecting and storing systems may be expected. For the construction of suitable systems for practical use some experiments are necessary in the near future.

44459 Solar technology in agriculture. Schulz, H. (Bayerische Landesanstalt fuer Landtechnik, Freising (Germany, F.R.); Landtechnischer Verein in Bayern e.V., Freising (Germany, F.R.)). pp 207-225 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 25: Landwirtschaftliche Nutzung von Sonnenenergie. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Agriculture provides good prospects for solar technology, such as high requirements for heat also in summer, large roof and ground areas, possibilities for do-it-yourself as well as generation of heat from straw and wood wastes and biological processes in addition to the direct solar energy. Amongst the application areas drying of hay and crops and heating of water and stables seem to be of special interest. The Institute for Agricultural Technology in Weihenstephan at present is at work to investigate basic dates for the useful application of solar energy, to check developments of the solar technological industry as to their usefulness in the agricultural sector, to develop simple collector and storage systems that can be written off within a short period of time and to build 'solar farms' as practical objects for demonstration and research.

44460 Solar grain drying. Muehlbauer, W. (Hohenheim Univ. (Germany, F.R.). Inst. fuer Agrartechnik). pp 227-241 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 25: Landwirtschaftliche Nutzung von Sonnenenergie. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Today, large quantities of energy, mainly in the form of fuel oil and electricity, are used to dry agricultural products like grain and corn. In the following contribution the energy needed in various drying techniques is analyzed and compared with the available amount of solar energy. Furthermore, the possibilities and limitations of solar grain drying in Germany are presented for the present state of development of solar technologies.

WATER HEATING

REFER ALSO TO CITATION(S) 44409, 44414, 44433, 44435, 44440, 44503

44461 (CONF-761220—, pp 183-185) **Solar energy system for domestic hot water heating.** McNamara, T.J. (V. A. Scavo and Associates, Chicago). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The proposed addition of a solar energy hot water heating system integrated into the existing domestic hot water heating system at the Museum of Science and Industry in Chicago, Illinois is discussed. The present hot water system and unique demands put upon it are described. A schematic flow and piping diagram is shown. (MHR)

44462 (CONF-761220—, pp 187-188) **Control and optimization of solar water heating systems in univeristy buildings.** Miller, G.L.; Morris, T.C.; Bierenbaum, H.S. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The production of an acceptable performance equation for the array of pressure welded collectors, and the use of this equation, to develop an optimum control strategy as a function of time of year, water demand function and storage system thermal stratification pattern are discussed. (MHR)

44463 Solar energy saves annually 5000 l heating fuel oil. Water heating and additional heating in Simbach/Inn. Brunner, R. *Mitteilungsbl. Dtsch. Ges. Sonnenenergie;* **2**: No. 5, 33(Sep 1977). (In German).

A solar energy plant is described. The collector surface has 18 m². The plant meets the major part of the heat consumption for water heating and supplies in the interseason part of the space heating. The solar energy converted into heat is stored in a 600 l tank. All in all, the plant is to save about 5000 l heating fuel oil per annum, i.e. some 45% of the overall heating fuel oil consumption. The plant costs approximately DM 20,000.

44464 New type dual storage unit for solar water heating. Mueller, B. (VAMA G.m.b.H. und Co. K.G., Hildesheim (Germany, F.R.)). pp 11-21 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 22: Speicherung, fuehlbare Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The design of the storage unit has a decisive influence on the operating efficiency of solar water heating systems. Unsuitable storage units can reduce the solar contribution to the water heating by a half. Various types of storage units are being compared and tested for effectiveness, and these include a new type of dual storage unit which enables the highest level of installation efficiency to be achieved, and also shows a favourable cost/utilisation relationship.

OTHER

REFER ALSO TO CITATION(S) 44320, 44497

44465 (CONF-761220—, pp 115-125) **Simulation of the solar assisted heating and snow-melting system of a commercial bank building in Buffalo, New York.** Chang, C.M. (State Univ. of New York, Buffalo); Raghavan, R.; Yu, C.P.; Worden, A.F. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The experimental solar assisted heating and snow-melting system was simulated and analyzed. The system consists of eighteen 3' x 6' PPG solar collectors, a B and G heat exchanger, a 430 square feet snow-melting panel for the drive-in paths, composed of arrays of underground ¾" I.D. tubes, a 4000 gallon storage tank, an electric resistance heater rated at 48 kW which serves as the primary heat source for the system, and an office building with 3260 square feet living space. The present perfomance predictions are compared with measurements taken from the building. It was demonstrated that the low grade energy needed for snow-melting can be advantageously supplied by high efficiency flat plate collectors operated at high flow rates. (MHR)

44466 (CONF-761220—, pp 283) **Performance of solar driven absorption refrigerator systems.** Eder, H. (Arya-Mehr Univ. of Tech., Teheran). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44467 (CONF-761220—, pp 365-384) **Utilization of solar energy for cooling and drying systems.** Ataguenduez, G. (Ege Univ., Bornova-Izmir, Turkey). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A model drying house was built. In this house wood was dried, and results of the experiments were compared with the results of the open air drying. In addition, an absorption refrigerator which uses solar energy was theoretically investigated. The cost estimations

were made as a function of the cooling capacity. A computer program was developed which computes the solar energy rate for a surface in any position on the earth. The results of the computation for Izmir, Turkey are given. (MHR)

44468 (SAND—78-0016C) **Solar powered irrigation: present status and future outlook.** Lukens, L.L.; Alvis, R.L.; Perino, A.M. (Sandia Labs., Albuquerque, N.Mex. (USA)). 1978. Contract EY-76-C-04-0789. 8p. (CONF-780527—1). Dep. NTIS, PC A02/MF A01.

From 4. energy symposium; Los Angeles, CA, USA (23 May 1978).

An alternate source to fossil fuel is needed for the future powering of the nation's irrigation pumps. Solar energy is a logical choice because insolation is usually abundant in areas requiring irrigation. One experiment is being conducted in New Mexico and another is being constructed in Arizona. The New Mexico experiment is constructed near Willard, New Mexico. It produces approximately 25 hp continuously during the irrigation season to direct drive a turbine-type well pump which delivers enough water to irrigate 100 acres. It utilizes 6720 sq ft (625 m^2) of distributive-type solar collectors to heat an oil heat transfer fluid. The hot fluid produced supplies a Rankine cycle engine and charges a unique design thermocline thermal storage system. The Arizona experiment will be a 150 kWe solar powered deep well irrigation facility which is currently under design and construction. The data collected from these experiments are being utilized in a systems and application analysis. The main objective of this analysis is to define optimal applications and designs for the important agricultural regions of the US. The annualized costs of solar irrigation systems are compared to the annualized costs of conventional irrigation techniques. The economics of present systems are about a factor of four higher than conventional sources, but future systems designed for mass production look better.

44469 **Portable solar cooker and the solar panel used therein.** Way, L.V. Jr. US Patent 4,077,391. 7 Mar 1978. Filed date 20 Dec 1976. 4p.

A portable solar cooker comprises an internally insulated metal housing having an oven compartment for slidably receiving a cooking tray. A plurality of adjustable sun reflectors arranged on the top of the housing direct the sun's radiation into a heat-generating area. The heat-generating area is insulated by the air space formed by two transparent windows. Beneath the inner window and directly above the oven roof are a plurality of heat generating strips formed from fibrous insulation material covered by thin sheets of black foil. A series of spacers maintain spacing between the strips. The solar panels comprising the windows, heat generators and an appropriate heated chamber form a part of the invention.

44470 **Desalination apparatus.** Ziehm, K.F. Jr. US Patent 4,077,849. 7 Mar 1978. Filed date 3 Nov 1975. 6p.

Desalination apparatus is described utilizing solar heating of metal member(s) such as balls, rollers, or metal endless belt(s) in a heating chamber and vaporizing saline water with the latent heat in said metal member(s) by spraying saline water thereon in a vaporizing chamber, a water-cooled condenser to condense the vapors, a trough to collect the condensate, a rinse tank to remove salt deposits and/or saline water from the metal member(s), and means for returning the rinsed metal member(s) for solar reheating.

44471 **Direct conversion of solar energy to mechanical energy.** Ray, E.D. US Patent 4,075,847. 28 Feb 1978. Filed date 7 May 1976. 8p.

Disclosed is a method and means for direct conversion of solar energy to mechanical energy through alternate warming and cooling of material consisting of highly aligned, high density polymer molecules. A strip of said material, when warmed by any means, contracts along its axis of alignment and such contraction can do mechanical work in a way mechanically similar to muscular contraction. A plurality of such strips mounted upon a rotor does work against gravity; the gravity field then returns the energy as torque.

44472 **Solar cigarette lighter.** Wiquel, A.W. US Patent 4,076,014. 28 Feb 1978. Filed date 12 Aug 1976. 4p.

A solar cigarette lighter comprises a hollow tube having over at least part of its length from one end a free inside diameter adapted to receive a cigarette, an inwardly projecting ring between the ends of the tube to limit motion of a cigarette through the tube, and a lens of positive power affixed at the other end of the tube, distant by substantially its own focal length from the ring, whereby upon aiming the tube toward the sun with the end of the tube containing the lens toward the sun, the sun's rays falling on the lens will be brought to focus on the end of a cigarette introduced into the tube from said one end as far as the ring, and the cigarette will be lighted.

44473 **Solar powered distilling device.** Tsay, Y.J.; Lin, K.C. US Patent 4,075,063. 21 Feb 1978. Filed date 17 Feb 1976. 4p.

A solar powered distilling device is described, and more particularly, a device wherein a plurality of convex lenses concentrate the heat energy of sunlight to heat and vaporize a quantity of water, said water vapor rising from a vaporization chamber to a cooling chamber by virtue of holes provided in the partition therebetween. The water vapor is cooled by virtue of the circulating air in an air cooling chamber, condensing the vapor into water droplets; said droplets being collected in special collection troughs provided for this purpose on the top portion of said partition.

44474 **Solar curing and drying structure and method of utilizing solar energy associated with available solar radiation in curing and drying various materials.** Huang, B.K. US Patent 4,069,593. 24 Jan 1978. Filed date 7 Jun 1976. 20p.

The present invention relates to a greenhouse curing and drying structure adapted to collect energy associated with available solar radiation and to utilize the heat associated therewith in curing and drying material within said greenhouse curing and drying structure. Basically the curing and drying structure comprises an outer transparent housing and an interiorly disposed solar energy collector housing defining a drying area or chamber thereunder. During phases of curing and drying material in the drying area or drying chamber, an outside air system is directed between said outer transparent housing and said collector housing where solar energy in the form of heat collected is transferred to the passing air system. The solar heated air system may, depending on the temperature conditions within the drying structure relative to the desired drying schedule, be directed to an air intake of a furnace system associated with said curing and drying structure or routed through an energy storage facility where the energy associated therewith may be stored for subsequent use.

SOLAR COLLECTORS AND CONCENTRATORS

REFER ALSO TO CITATION(S) 44370, 44443, 44444, 44564, 44923

44475 (CONF-761220—, pp 13-14) **Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling.** Rice, F.H. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A series of metal vanes are designed with a solar selective coating with high absorptance and low emittance properties on one side and a high reflective finish on the opposite side. Each vane is constructed of two separate formed metal strips that lock together and are held together under spring tension. The vanes, when assembled, have a small chimney space between the heat collecting side and the reflective side, thus allowing the heated air to rise when the selective coated surface is exposed to the sun's rays and when the reflective surface is exposed the air space acts as an insulator. The vanes are assembled into standard louver drapes. (MHR)

44476 (CONF-761220—, pp 51-58) **Investigation into solar heaters with some methods for convection suppression.** Sayigh, A.A.M. (Univ. of Riyadh, Saudi Arabia). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Experiments were conducted on flat plate collectors with various honeycomb-type structures and with collectors having various gap thicknesses in order to suppress convention loss. A theoretical analysis of heat loss in a collector is presented. (MHR)

44477 (CONF-761220—, pp 59-61) **Comparative performance of several flat plate designs.** Rupp, M.W. (Olin Brass, East Alton, IL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Two collector "home boxes" were built using readily available construction materials. These boxes are large enough to contain most of the modular absorber plates on the market today. Two individual plates each of a different design are tested simultaneously on an exactly-normal-incident altazimuth test mount. (MHR)

44478 (CONF-761220—, pp 63-71) **Thermal, fluid flow, and mechanical charcteristics of a subatmospheric distributed flow flat plate collector.** Spencer, D.L.; Foster, C.A.; Robinson, J.W.J.; Suiter, R.L. (Univ. of Iowa, Iowa City). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Results of tests for a 440 ft^2 negative pressure, distributed flow collector system installed to heat a 13,000 gal swimming pool in Eastern Iowa are reported. The following are reported: construction

details of absorber plates including information on spacer mechanism (deep texturing), operational experience with pressure and flow controls, and experience with automatic draining and filling to eliminate the need for anti-freeze. (MHR)

44479 (CONF-761220—, pp 73) **Experimental and theoretical performance study of solar collectors.** Dabiri, A.; Grossman, G. (Arya-Mehr Univ. of Tech., Teheran). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44480 (CONF-761220—, pp 75-79) **Performance of low cost solar panels.** Dubensky, R.G. (Oklahoma State Univ., Stillwater). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The design and testing of solar collectors constructed of recyclable materials, aluminum beverage cans and used newspaper printing plates, are reported. The units are fabricated with basic hand tools and the insulation materials include low cost recyclable newspaper (chemically treated to reduce flame spread). Some cost data and sketches of the collectors are included. (MHR)

44481 (CONF-761220—, pp 81) **Thermal testing of flat plate collectors.** Poteat, L.E. (Univ. of Miami, Coral Gables, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44482 (CONF-761220—, pp 83-84) **Design criterion on flat solar collectors based on thermal efficiency measurements.** Lin, S. (Concordia Univ., Montreal). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

An experimental investigation of the effect of the geometric configuration of flat solar collectors on thermal efficiency was conducted. The collector designs and the results and conclusions are described. (MHR)

44483 (CONF-761220—, pp 93-96) **New black chrome selective absorbing surface.** Riddiford, C.L.; Driver, P.M.; Simpson, R.J. (Inst. of Tech., Sydney). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Solar selective absorbing films to improve the efficiency of flat plate collectors are of interest. The properties of an electroplated black chrome surface on a copper substrate are discussed. (MHR)

44484 (CONF-761220—, pp 97-98) **Analytical model of flat plate solar collectors.** McMordie, R.K. (Martin Marietta Corp., Denver). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The analytical model which was developed accounts for solar and IR radiation, conduction and convection losses to the ambient air, forced convection between the collector working fluid and the absorber plate, and conduction along the absorber plate between the fluid channels. These modes of heat transfer are coupled using a thermal network approach. Formulating the problem in this manner provides an overall system description which can be easily input into a generalized thermal analyzer computer program. (MHR)

44485 (CONF-761220—, pp 99-104) **Optimal combinations of flat plate collectors configurations.** Lobo, P.C.; Almeida, P.I.F.; Nobrega, E.G.O. (Universidade Federal da Paraiba, Paraiba, Brazil). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Configurations of flat plate collectors are compared on the basis of efficiency and power output per unit cost of collection for both thermal and power plant applications. The effect of changes in absorber material and design on collector efficiency and economy is estimated. The effect of the price of glass on collector economy is also considered. (MHR)

44486 (CONF-761220—, pp 105-106) **Compatibility of materials in solar collectors.** Poteat, L.E.; Wendelin, O.P. (Univ. of Miami, Coral Gables, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44487 (CONF-761220—, pp 201-205) **Vacuum tube vee-trough collector for solar heating and air conditioning applications.** Selcuk, M.K. (Jet Propulsion Lab., Pasadena). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A vacuum tube receiver combined with an asymmetrical vee-trough is proposed as an efficient solar heat collector for heating and air conditioning applications. Efficiency improvements for the vacuum tube receiver and reductions in collector cost are expected with use of the vee-trough reflector. (MHR)

44488 (CONF-761220—, pp 207-209) **FMSC collector subsystem being supplied for Sandia Laboratories' total energy system.** Eggers, G.H.; Russell, J.L. (General Atomic Co., San Diego, CA). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The fixed mirror solar concentrator (FMSC) subsystem design is described and progress in its fabrication is reported. (MHR)

44489 (CONF-761220—, pp 211-213) **Solar collector based on an array of lineard Clipped-V channels.** Bynum, F.A.; Donnelly, R.L.; Bordoloi, K.C. (Univ. of Louisville, KY). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

This channel array which was originally proposed for solar cells is adopted for use as a heating asorbing collector. Equations used to study the important parameters related to a "clipped-V" channel absorbing collector are shown. (MHR)

44490 (CONF-761220—, pp 215-221) **Design and operational evaluation of a non-tracking solar concentrator.** Villanueva, J.; Truong, H.V. (Florida Atlantic Univ., Boca Raton). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The design, construction, and operational evaluation of a truncated non-tracking concentrating solar collector of the type proposed by R. Winston are described briefly. The collector design was optimized for operation in the range of temperatures required to fire an absorption air conditioning system with reasonable efficiency. The collector consists of a hollow axially symmetric "cone" with reflective walls. Each cylindrical "cone" was to have a length of 6 feet. Tests were performed by controlling the angle between the direct solar beam and the optical axis of the collector and maintaining this angle constant during each individual run at either 0^0, 5^0, 10^0, or 15^0. (MHR)

44491 (CONF-761220—, pp 223-224) **Discussion of a planar, Fresnel reflector, rotatable facet concentrator.** Anderson, H. Jr. (Applied Solar Tech., Inc., Silver Spring, MD). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The concentrator under discussion, commonly (SPSC), maintains fixed target focus by the uniform rotation of ganged reflector facets. It offers the advantages of low tracking power, low cost, low wind loads, and a potentially useful configuration for architectural applications. Some of the design aspects for the SPSC are discussed. (MHR)

44492 (CONF-761220—, pp 225-226) **Numerical simulation of parabolic collectors for solar heat exchangers.** Campo, A. (Univ. of Puerto Rico, Mayaguez). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The numerical simulation of the thermal performance of a parabolic collector system is covered. A computational method of analysis is presented in order to compute the axial temperature variation of a heat generating fluid along a circular tube. (MHR)

44493 (CONF-761220—, pp 227-228) **Yes: an industrial focusing non-tracking collector will work in Northeastern Ohio.** Lazor, J.M.; Alexander, C.K. (Youngstown State Univ., OH). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The potential energy availability from a compound parabolic concentrator (CPC) in northeastern Ohio is explored. When compared to the flat plates the projected efficiency curves indicate significant improvements by CPC designs at both reduced energy input levels and elevated receiver temperatures. (MHR)

44494 (CONF-761220—, pp 233-236) **Moderately concentrating solar collector.** Robertson, H.S. (Univ. of Miami, Coral Gables, FL). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A collector is described and analyzed having the following properties: (1) Its efficiency and utlimate temperature will always equal or exceed those of a comparable flat-plate collector; (2) On a sunny day the performance will be superior to that of a flat-plate collector; (3) No tracking will be required after initial installation. The collector consists of one or more semi-cylindrical mirrors with a multisectional absorber element. (MHR)

44495 (CONF-761220—, pp 237-242) **Optimization of heat exchangers for solar concentrators.** Damshala, P.R.; Williams, J.R. (Georgia Inst. of Tech., Atlanta). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The parametric study, development, and optimization of heat exchangers for the faceted fixed mirror concentrator are covered. Predicted values of collection efficiency and frictional losses were obtained for varying values of specular solar input, inlet fluid temperatures, environment temperatures, and wind velocities. (MHR)

44496 (CONF-761220—, pp 253-258) **Performance of Rankine Cooling System with intermediate temperature solar collectors.** Sakhuja, R.K. (Thermo Electron Corp., Waltham, MA). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The performance of Rankine Cycle Cooling System utilizing solar energy as the heat source for residential application is described. The optimum heat source temperature selector is a function of the type of collector. The performance of various candidate collectors which might be considered is shown. It is consluded that the evacuated tube collectors have the best potential of yielding optimum solar cooling system. (MHR)

44497 (CONF-761220—, pp 285-287) **Solar heated absorption refrigeration system.** Hatami, R.; Eder, H. (Arya-Mehr Univ. of Tech., Teheran). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The solar refrigeration system is described briefly. The collector is a parabolic cylinder mirror with a collecting tube filled with water. The output power of two configurations of this collector design is shown. (MHR)

44498 (TID—28168) **Demonstration salt gradient solar pond. First biannual progress report to the U.S. DOE.** (New Mexico Univ., Albuquerque (USA). Dept. of Physics and Astronomy). 10 Oct 1977. Contract EG-77-S-04-3977. 50p. Dep. NTIS, PC A03/MF A01.

A record high temperature for NaCl gradient ponds: 93°C (199°F) on August 6, 1977. In order to reach this temperature a density gradient of 1.7 x 10^{-3} gm/cm^4 was required. Instabilities were observed in the gradient when the pond was near its peak temperature which were attributed, at least in part, to sloshing modes induced by sustained winds. Throughout the spring and summer period, as the temperature of the pond increased, the few instabilities that occurred were easily and rapidly corrected. Progress was made toward a mathematical model of the stable solar pond.

44499 **Ideal flux concentrators with reflector gaps.** Winston, R. (University of Chicago, Enrico Fermi Institute and Physics Department, Chicago, Illinois 60637). *Appl. Opt.;* **17**: No. 11, 1668-1669(1 Jun 1978).

A design for a solar concentrator is presented that provides maximum flux concentration on the physical absorber.(AIP)

44500 **Solar heat absorber.** Dawley, R.W. US Patent 4,080,956. 28 Mar 1978. Filed date 2 Jun 1975. 6p.

An insulated, watertight housing is described having a transparent panel forming a closure for the upper end and an absorption plate disposed inwardly of the transparent panel and provided with piping secured to the bottom surface thereof with the plate and piping being arcuately curved with the convex surface disposed upwardly and provided with a black coating on the upper surface thereof. In one embodiment, the piping is connected with an insulated storage tank for water circulation. In another embodiment, the piping serves as guide means and heat exchange means with air passing under the plate with this embodiment also including curved members which form a venturi secured to the underside of the plate to render the heat exchange between the plate and circulating air more efficient.

44501 **Portable solar energy collector.** Sandstrom, W.R. US Patent 4,080,955. 28 Mar 1978. Filed date 10 May 1976. 4p.

A flat flexible bag of water-impervious material is provided with inlet and outlet tubes extending along the inside of said bag adjacent respectively opposite edges. The bag is divided into transverse compartments, and the inlet and outlet tubes each have openings communicating with each of the compartments.

44502 **Solar collector apparatus.** de Wilde, G.; Weiss, G. US Patent 4,080,954. 28 Mar 1978. Filed date 23 Apr 1976. 4p.

Solar collector apparatus is described comprising a panel of series connected all glass solar tubes, each tube having an outer evacuated glass cylindrical jacket with a half circular concave cylindrical reflector on its inner surface, blackened heat absorption glass tubing within the jacket secured by glass connection support means to the jacket in an offset position to lie in the focal plane of the reflector, and circulating fluid storing the energy within the heat absorption tubes.

44503 **Solar panel.** Bennett, C.J. US Patent 4,080,957. 28 Mar 1978. Priority date 20 Jan 1975, United Kingdom of Great Britain and Northern Ireland (UK). 12p.

The invention provides a method for heating water by solar radiation using a reflux condenser system in which a heat transfer liquid is boiled by solar radiation and the vapor used to heat the water in a heat exchanger. The solar panel itself is highly efficient in operation and comprises a solar plate which incorporates a number of tubes containing the heat transfer liquid, these elements being located within an evacuated enclosure. Vapor from the boiling liquid passes up these tubes into a jacket surrounding a pipe through which the water to be heated is passed; liquid condensing within the jacket passes back to the tubes in the solar plate under gravity. The system incorporating the tubes and the jacket is maintained at a low gas pressure so that boiling of the heat transfer liquid takes place whenever there is a temperature difference between the panel and the heat exchanger.

44504 **Radiant energy collector panel and system.** Zwillinger, D. US Patent 4,079,724. 21 Mar 1978. Filed date 6 Feb 1976. 16p.

A radiant energy collector panel comprises a plurality of outwardly facing open ended channels extending inwardly from the outer face of the panel for receiving radiant energy directed at the outer face of the panel wherein each channel includes an inwardly extending concave interface surface and an opposed inwardly extending convex interface surface. The opposed inwardly extending concave and convex interface surfaces provide increased areas exposed to the radiant energy, absorb and substantially reflect and amplify radiant energy of larger angle of incidence inwardly to the inner portion of the channel, substantially absorb radiant energy of smaller angle of incidence of the primary and reflected radiant energy, and reabsorb reradiated energy of lower spectral frequency therefrom, to provide a collector panel of relatively high efficiency. Various forms of such collector panels are disclosed. The radiant energy collector panel may be arranged inside an essentially slanted heat exchange passage and insulating space connected by upper and lower horizontal ducts to a substantially vertically arranged heat storage passage containing a heat storing medium. A heat transfer medium, such as air, gravity circulates through the passages and ducts absorbing heat from the collector panel in the heat exchanging passage and heating the heat storing medium in the heat storage passage.

44505 **System for storage and use of solar energy.** Voelker, P. US Patent 4,079,726. 21 Mar 1978. Filed date 23 Apr 1976. 8p.

A system is described for economically storing solar energy in the form of heated water. The system includes an above ground swimming pool in conjunction with a solar collector whereby the water of the pool is heated and stored therein until needed for use. In one form of the invention, the solar collector comprises a solar cover overlying or floating on the water in the pool. The cover is provided with an inlet and outlet through which the pool water is circulated and heated by the solar energy penetrating the cover. In another form the solar collector comprises a remotely disposed collector comprising a covered box having therein a plurality of channels connected in liquid flow with the pool water.

44506 **Solar ladder.** Chadick, R.E. US Patent 4,079,725. 21 Mar 1978. Filed date 24 Jan 1977. 6p.

Solar ladders are provided in each of which a plurality of parabolic solar reflectors are vertically spaced from each other between a pair of upright support members separated in an east-west direction. Parallelogram linkage on each of the upright supports allows a control rod associated with each support to move in an arcuate path in a vertical plane while maintaining a vertical orientation. Horizontal support bars extending between the vertical control rods adjust the inclination of the parabolic reflectors between a horizontal orientation, to focus the rays of the sun as the sun rises and sets on the horizon, and an elevated orientation during midday. The linkage also maintains horizontal solar energy collectors at the parabolic focus throughout movement of the reflectors. The solar

ladder elements can be linked together to operate in unison from a single moving force.

44507 Method of producing coatings having a high absorption in the range of the solar spectrum. Scholz, H.; Jungk, H. (to U.S. Philips Corp.). US Patent 4,080,269. 21 Mar 1978. Priority date 17 Dec 1975, German, Federal Republic of (F.R. Germany). 4p.

A method is described for producing a black coating highly absorbent in the solar spectrum range by electrodeposition from an aqueous solution containing a soluble cobalt compound and a large amount of alkali thiocyanate.

44508 Solar energy collector. McKeen, T.R.; Stephenson, R.B. US Patent 4,078,549. 14 Mar 1978. Filed date 5 Aug 1976. 6p.

The solar energy collector concentrates the sun's rays on a liquid medium that is used to power a mechanical energy device such as a positive displacement steam engine. A reflective surface of the solar energy collector is made from an arcuate portion of a circle having a trough-like surface to reflect and concentrate the sun's rays in a plane. A collector having a liquid medium flowing therethrough is located in the plane. The collector is constructed to extend across the entire plane for complete absorption by the liquid medium of the sun's rays reflected from the reflective surface. The collector and reflective surface are connected together for pivotal movement by an appropriate tracking apparatus so that the sun's rays are continually reflected during normal daylight hours through the plane in which the collector is located.

44509 Solar heater and condenser. Malecek, J. US Patent 4,078,547. 14 Mar 1978. Filed date 2 Sep 1975. 4p.

A solar heat receiving and utilizing device is described including a main housing with a Sun-ray receiving window with a main channel into which the heat rays are conducted, and ultimately directed through the channel to outlet windows for heating boilers and similar heat using devices. It uses both one-way influx windows about a main channel, and also glass prisms to conduct the Solar rays and bend them into the main channel. Heat insulating lagging is used around the main housing to block incidental heat escape during conversion from Sun rays to utilizable heat.

44510 High efficiency solar panel. Kapany, N.S. (to Kaptron, Inc.). US Patent 4,078,548. 14 Mar 1978. Filed date 30 Jan 1976. 10p.

A window portion is interposed between the incident light and a heat absorbing portion and at least one of the heat absorbing and window portions has a plurality of spaced apart reflecting surfaces, separate ones of which face each other and transmit the incident light by multiple reflections to the heat absorbing portion. In at least one embodiment, these opposed reflecting surfaces converge in the direction of light travel from the window portion to the heat absorbing portion and infrared reflecting means are interposed between the window portion and the heat absorbing portion to return infrared light emitted by the heat absorbing portion back to the heat absorbing portion.

44511 Solar energy operated motor apparatus. Glynn, K.P. US Patent 4,079,249. 14 Mar 1978. Filed date 8 Feb 1977. 8p.

A motor apparatus is described for orientating solar responsive devices. The motor apparatus is solar energy operated and comprises a plurality of containers connected in closed systems having fluid therein, support means for the containers including rotatable parts, and a solar window-containing component which permits solar energy to strike surfaces of the containers so as to change the distribution of fluid in the systems to cause the rotatable parts, and thus an attached solar responsive device, to rotate, e.g., in an arc so as to follow the sun.

44512 Low-loss solar heat collectors. Justi, E. (to Metallgesellschaft AG). US Patent 4,078,545. 14 Mar 1978. Priority date 23 Apr 1975, German, Federal Republic of (F.R. Germany). 6p.

A solar-heat collector comprises a sheetmetal shallow box open on one side and receiving an absorber provided with passages traversed by a heat-transfer fluid. The absorber is provided with means for feeding the fluid to the passage and withdrawing the fluid therefrom for use. The feeding conduit means is in heat-transfer contact with the sheetmetal of the box so that an indirect exchanging relationship between the box and the fluid, as a preliminary heat exchanger, is established. A covering of a translucent material closes the open side of the box above the absorber.

44513 Solar energy collecting device. Zani, D.A. US Patent 4,078,546. 14 Mar 1978. Filed date 11 May 1977. 4p.

A solar energy collecting device is described comprising a collector plate. A wall member is attached to the periphery of the collector plate and to the periphery of a panel to form an enclosure. The central portion of the panel is transparent and transmits solar energy therethrough and into the enclosure. A run of tubing passing heat transfer fluid during use is disposed within the chamber. The ends of the tubing pass through an aperture in the wall member. The outside of the enclosure is insulated with polyurethane foam that is applied by spraying process.

44514 Solar energy heat collector. Mattson, J.P. US Patent 4,077,393. 7 Mar 1978. Filed date 14 Jan 1976. 6p.

An apparatus is described for collecting radiant solar energy to provide solar heating which may be used singly or in multiples as modular units. The apparatus is constructed as a self-contained unit having an insulated base, an energy receiving surface positioned adjacent the insulated base, and a heat exchange fluid conduit for circulating a heat exchange fluid in contact with the energy receiving surface. Other conduits are provided to introduce a heat exchange fluid and to receive or collect the fluid after it has been in contact with the energy receiving surface. The top or cover of the collector module is positioned in spaced relationship adjacent the energy receiving surface. The cover is transparent to solar energy and is provided with a plurality of spaced raised structures having surfaces angularly disposed to transmit radiant solar energy to the energy receiving surface. Side walls provide a self-contained unit and permit mounting of the unit on a surface.

44515 Solar radiation collector. Banet, J. US Patent 4,076,024. 28 Feb 1978. Filed date 16 Mar 1976. 4p.

The solar collector is formed with a first plate member and a second plate member in close spatial disposition and seamed along the edges of the plates to form a closed liquid containing planar chamber therebetween, said chamber having an inlet and an outlet port. The first plate member is provided with substantially parallel shallow channels projecting toward the interior of the chamber and the second plate member is provided with a plurality of shallow recesses projecting toward the interior of said chamber. The web portions of said channels and said recesses engage each other whereby longitudinal passages are formed along the inner surface of the first plate and longitudinal and transverse passages are formed along the inner surface of the second plate.

44516 Solar energy collector. Mattson, J.P. US Patent 4,076,015. 28 Feb 1978. Filed date 14 Jan 1976. 8p.

An apparatus is described for collecting radiant solar energy upon an energy receiving surface comprising a solar energy collecting module having a base and a plurality of radiant energy collector module units angularly disposed to said base. The collector units consist of a raised surface or surfaces transparent to incident solar energy. The configuration and angles of the collector module unit surfaces with respect to the base and the energy receiving surface are varied to provide optimum collection of solar radiation. The invention also provides for a plurality of reflective surfaces angularly disposed to the base and energy receiving surface where a combination of transparent and reflective surfaces provide for optimum collection of radiant energy. The reflective surfaces are angularly disposed to the base to reflect incident radiant energy to an adjacent transparent surface for transmission to the energy receiving surface.

44517 Solar heater. Copping, B.G. US Patent 4,076,026. 28 Feb 1978. Filed date 12 Oct 1976. 6p.

A solar heater for a liquid has a panel-like unit including a plurality of tubes lying in and defining a plane which panel unit includes an inlet header, an outlet header, and a connector header. A set of a plurality of relatively small diameter tubes connecting the inlet header to a length of the connector header, while a second set of relatively small diameter tubes connect another length of the connector header to the outlet header tube, and support means support the panel unit by slidably engaging the tubes of the two different sets of tubes to compensate for expansion and contraction of components of the panel unit.

44518 Apparatus for the utilization of solar heat. Phillips, M.E. US Patent 4,076,016. 28 Feb 1978. Filed date 14 Oct 1975. 6p.

The invention relates to a unique apparatus for the utilization of solar heat which incorporates a hexagonal shaped collector element, which achieves maximum heat utilization in conjunction with a heat pipe for transfer of the heat collected by the element. Various minor modifications can be made to the heat collector element and/or the heat transfer pipe without departing from the spirit or the scope of the invention. Basically, however, it is the hexagonal shaped heat collector element with the heat transfer pipe passing therethrough at substantially the optimum position so that maximum heat transfer occurs from the heat collector element to the pipe within each individual element. The entire apparatus can be adjusted for optimum sun angle, depending upon the hemisphere or latitude of use, and extremely efficient heat transfer and use of solar energy is possible.

44519 Solar steam boiler. Parker, L.W. US Patent 4,076,025. 28 Feb 1978. Filed date 22 Nov 1976. 10p.

A solar heater comprising two or more containers nested one within the other for the solar heating of a gaseous medium such as air therein. Each container is provided, near its lower end, with a

solar radiation absorbing metal sheet which, when it becomes hot, rises the temperature of the air within the container causing the heated air to rise to the top of the container where it transfers some of its heat to the adjacent container and to the outside air, thereby creating convection currents. The innermost container is provided with a boiler structure positioned to be heated by incident solar radiation to a temperature sufficiently high to convert water within the boiler structure to steam. The boiler structure is of thin flat configuration, is covered by radiation absorbing material on the face thereof which is exposed to solar radiation, has its opposite face polished to a shine, has a number of reinforcing members extending between the opposing faces of the boiler structure, and exhibits surface sections of smoothly curved outwardly bulging convex configuration between the reinforcing members to provide a comparatively light weight boiler structure having adequate strength to withstand the pressure of steam generated therein. In one form of the invention a cylindrical lens is provided to concentrate the sun's rays and superheat the steam obtained from the boiler.

44520 Solar collector having selective film of improved stability to liquid water condensate. Hajdu, J.; Sosnowski, R.A. (to Enthone, Inc.). US Patent 4,074,706. 21 Feb 1978. Filed date 30 Jul 1975. 8p.

A solar collector is described including a copper or copper alloy base and a selective solar heat energy-absorptive coating or film of improved stability to liquid water on the base. The selective film is characterized by having a solar absorptivity of 0.90 or higher, infrared emissivity no more than 0.02, and a stability such that its selectivity is not significantly reduced after contact with liquid water condensate over a prolonged, cumulative, non-continuous time in excess of 15,000 hours.

44521 Method and apparatus for heating a fluid medium by means of solar energy. Posnansky, M. US Patent 4,074,678. 21 Feb 1978. Priority date 7 Jan 1974, Switzerland. 6p.

A receiver is described for collection of concentrated solar energy comprising a tube permeable to solar radiation and an elongated body capable of absorbing such radiation disposed within the transparent tube. The body comprises a series of vanes depending from a common center where the angle between two adjoining vanes is not greater than 72°.

44522 Solar panel. Schriefer, A.H. Jr. US Patent 4,073,282. 14 Feb 1978. Filed date 16 Sep 1976. 6p.

A solar collector for use in receiving solar radiation and converting the same to heat. A matrix of plural layers of slit-and-expanded sheets are contained within the solar collector and the heat produced by the matrix absorbing solar radiation is transferred by convection into a forced fluid path. The surfaces of the slit-and-expanded sheets are coated to absorb and convert the radiant energy to heat and the various layers are relatively positioned at 90° to provide improved tracking of the sun in its diurnal path, the sheets having unidirectional raised portions to more efficiently absorb the sun's rays. A reflective surface behind the matrix reflects solar energy back into the matrix. A fluid, usually air, is heated by convection as it is forced through the matrix in the solar collection.

44523 Modular construction for solar heat collector. Loef, G.O.G. (to Solaron Corp.). US Patent 4,073,283. 14 Feb 1978. Filed date 27 Feb 1975. 8p.

An open top housing member, the top being arranged to be closed by a solar radiation transparent covering, is arranged to be mounted in side by side and end to end relationship with similar members to provide a large area solar heat absorber unit, and each housing member includes passageways for the flow of fluids, such as air, and means for joining the members at the passageways, thereby providing an inlet fluid manifold at one edge of the combined housings and an outlet fluid manifold at the opposite edge of the housings providing the transfer of heat absorbed by the unit to the transfer fluid. Generally, the housing members are made of lightweight sheet metal and may be secured together either by crimping edges and flanges of adjoining members or lateral mechanical pressure at the passageways, and each is provided with an adjustable gate member for varying the flow pattern of the fluid through each individual member.

44524 Method of fabricating a solar heating unit. Godrick, J.A.; Sliney, J.L. (to Kennecott Copper Corp.). US Patent 4,072,262. 7 Feb 1978. Filed date 4 Apr 1977. 6p.

A method of fabricating a solar heating unit having tubular conduits for containing high pressure fluids is disclosed. The method comprises the steps of forming a thin sheet of soft metal, preferably a fully annealed copper sheet, by applying sufficient temperature and pressure to creep or thermally form the sheet in a grooved plate using an assembly of the fluid conduits having a paste solder applied thereon. The solder is melted during the creep forming step to form a good metallurgical bond between the sheet and the conduits.

44525 Heat absorber for solar energy. Loef, G.O.G. (to Solaron Corp.). US Patent 4,072,142. 7 Feb 1978. Filed date 2 Sep 1975. 6p.

In a solar heat collector, a corrugated screen or a transverse series of perforated plates is on the underside of a heat absorber plate and heated by conduction and radiation from the absorber plate. The screen or perforated plates increase the surface area for heat transfer, especially to air, and produce turbulence of the heat transfer medium to increase heat transfer therefrom and also from the underside of the absorber plate. The screen or perforated plates are also adapted to support the heat absorber plate in a desired position.

44526 Solar absorption surface panel. Santala, T.J. (to Texas Instruments Inc.). US Patent 4,071,659. 31 Jan 1978. Filed date 13 Nov 1975. 4p.

A composite metal of aluminum and nickel is used to form an economical solar absorption surface for a collector plate wherein an intermetallic compound of the aluminum and nickel provides a surface morphology with high absorptance and relatively low infrared emittance along with good durability.

44527 Solar energy collecting apparatus. Henderson, T.D. (to Solar Energy for the Family Inc.). US Patent 4,071,016. 31 Jan 1978. Filed date 23 Aug 1976. 4p.

The specification and drawings disclose an apparatus for collecting incident solar radiation and using it to heat a fluid such as air. The disclosed apparatus comprises a housing having a generally triangular cross-section which defines an upwardly facing chamber having its open upper end closed by a sheet of solar transmissive plastic material. Positioned within the chamber, generally at the juncture of the bottom and end wall, is a mass of heat-absorbing material. A plurality of focusing lens are positioned within the chamber and arranged to focus solar radiation upon the mass. Heat absorbed and collected by the mass is extracted by air which is passed over the mass by a duct system including a blower. The blower and duct system is arranged to cause air to pass over and about the heat-absorbing mass to an outlet duct from which it is conveyed to a point of use or storage.

44528 Solar heat collector system, parts therefor and methods. Perkins, C.H. (to Robertshaw Controls Co.). US Patent 4,071,018. 31 Jan 1978. Filed date 30 Aug 1976. 8p.

A solar heat collector system having a fluid storage unit that is interconnected to the inlet of a solar heat collector by a pump and is also interconnected to the outlet of the collector by a return. A temperature sensor is operatively interconnected to the pump to turn on the pump when the sensor senses a temperature of a first certain magnitude above the temperature of the fluid in the storage unit and to turn off the pump when the sensor senses a temperature below a second certain magnitude above the temperature of the fluid in the storage unit. An aspirator unit is provided for directing fluid from the return to adjacent the senor to change the temperature thereof.

44529 Solar concentrator and energy collection system. O'Neill, M.J. (to E-Systems, Inc.). US Patent 4,069,812. 24 Jan 1978. Filed date 20 Dec 1976. 18p.

A curved prismatic, Fresnel-type lens is primarily used for concentrating sunlight in a solar energy collector. The lens comprises a substantially smooth, convex outer surface and a plurality of prisms arranged side-by-side along a curve on the inner surface to direct incoming light to a common area. Each of the individual prisms has a front and back face joined by a bottom face. The front and back faces of the prisms are oriented such that the angle of incidence of the incoming light with the front face is equal to the angle of incidence of the outgoing light with the back face. Further, each of the prisms is arranged along the curve such that they do not obstruct light passing through any adjacent prism. The bottom face of each prism is over-extended beyond the path of the light passing through the prism to prevent loss of light due to blockage by the bottom face or the rounded point between the back face and bottom face. The improved lens is used in combination with a solar energy collector comprising the improved concentrator and a suitable energy receiver for converting incident sunlight into a useful energy output.

44530 Solar collectos. Tabor, H.Z. US Patent 4,069,811. 24 Jan 1978. Priority date 24 Apr 1975, Israel. 6p.

A solar collector is described including an absorber having at least one channel for conducting a fluid receiving the heat absorbed and a housing enclosing the absorber and having radiation-transparent windows covering and spaced from both faces of the absorber. Partition members are disposed between the absorber and the housing and effective to block the circulation of air flowing in the space between one face of the absorber and the housing from flowing to the space between the other face of the absorber and the housing, to thereby reduce convection losses from the absorber.

44531 Vacuum solar collectors. Tabor, H.Z. US Patent 4,069,810. 24 Jan 1978. Priority date 24 Apr 1975, Israel. 6p.

A solar collector, comprises: a tubular housing of radiation-transparent material hermetically closed at one end; a smaller-diameter tubular absorber having a radiation-absorbing surface, the absorber being coaxially disposed within the tubular housing and hermetically closed at one end; the opposite ends of the tubular housing and absorber being sealed together, and the space between the two being evacuated; and heat-extracting means for passing a heat-exchange medium through said opposite end of the tubular absorber into the interior thereof to extract heat therefrom.

44532 Solar heat collecting porous building blocks. Strand, L.L. US Patent 4,069,809. 24 Jan 1978. Filed date 19 Jul 1976. 4p.

A solar heat collecting building block is described, having top, bottom, front, back and side surfaces, the block having at least one vertical passage extending therethrough from the bottom surface to the top surface, the top surface having an upper portion which protrudes above the plane of the top surface, the bottom surface having a recessed portion for mating receipt of the upper portion of another block, the front surface of the block having at least one transparent member embedded therein to allow solar rays to pass therethrough and strike the interior portions of said block and heat the same.

44533 Self-jigging method of fabricating solar collector heat trap from flexible plastic roll material. Root, E.F. (to Itek Corp.). US Patent 4,068,361. 17 Jan 1978. Filed date 26 Jan 1976. 4p.

A solar energy collector of low cost and high thermal efficiency is disclosed having a heat trap produced by zigzagging a thin strip of polyethylene terephthalate between opposite sides of the trap while wrapping the strip about rows of dowels positioned at opposite sides of the frame of the solar collector. A window of soda lime glass filters uv radiation to inhibit discoloration of the plastic heat trap walls. An absorber plate having fluid pipes therein is positioned underneath the heat trap and a first layer of fiberglass, and a second layer of polyurethane foam are positioned below the absorber plate. The fiberglass layer prevents overheating of the polyurethane foam layer to in turn inhibit the formation of toxic fluids, which may condense upon the underside of the window to reduce the efficiency of the collector.

44534 Solar heat pipe. Fehlner, F.P.; Ortabasi, U. (to Corning Glass Works). US Patent 4,067,315. 10 Jan 1978. Filed date 24 Oct 1975. 12p.

A heat pipe is described for converting solar energy into thermal energy comprising an envelope provided with an evaporator region and a condensor region, a quantity of vaporizable working fluid within the envelope, a wick within the envelope having capillary means for transporting the working fluid, and, preferably, evacuated transparent container means surrounding the evaporator region for insulating the evaporator region. The evaporator region of the heat pipe is made for a material which is substantially transparent to radiation in a selected range of the solar spectrum, and a wick therewithin which substantially absorbs radiation in at least a portion of the range of the solar spectrum transmitted through the evaporator region. Solar energy is thereby converted into thermal energy or heat directly within the wick, and the heat generated within the wick causes portions of the working fluid therein to evaporate.

44535 Solar energy collector panel. Hubbard, S.E. (to Kawneer Company, Inc.). US Patent 4,067,317. 10 Jan 1978. Filed date 18 Jun 1976. 14p.

A solar energy collecting panel includes a pair of elongated spaced apart tubular fluid headers formed of heat conductive material and a plurality of elongated hollow tubular panel elements or risers formed of heat conductive material extended between the headers. The panel elements have an outer wall adapted to face and absorb solar radiation and transfer the heat directly into fluid passing through the tubular passages of the risers which are arranged in edge to edge, side by side relation with opposite ends of the risers connected in direct fluid communication with a fluid passage in the header² through openings in a wall section thereof. The panels are especially adapted for interconnection together in an array and the headers in the panels are formed with a perforated inner wall dividing the fluid flow into a pair of passages; one passage for directing some of the fluid between the headers and the risers and the other passage acting as a plenum chamber or conduit for passing the fluid to the next adjacent panel.

44536 Solar energy collector system. Bollefer, D.L. (to Dwight L. Bollefer). US Patent 4,067,314. 10 Jan 1978. Filed date 29 Dec 1975. 4p.

A solar energy heating or cooling system and method of performing the same is disclosed comprising a solar collector mechanism disposed generally on the roof of the structure for which it is to be used and supplied internally with a heat transfer medium of the halogenated hydrocarbon family having characteristics permitting expansion from a liquid to a gas, the collector mechanism being connected to an energy storage means having a plurality of conduit means disposed therewithin and connected to a reservoir for collection of a liquid, the liquid being pumped back to the solar collector mechanism by a pump for expansion into a gas, with control means being connected between the solar collector mechanism and the pump for controlling the level of the heat transfer medium.

44537 Glazing for transmitting solar radiation. Olink, H.; Ruye, J.D. (to BFG Glassgroup). US Patent 4,066,815. 3 Jan 1978. Priority date 8 Jul 1975, France. 12p.

A glazing unit is described permitting collection of an increased amount of incident solar energy and composed of a substrate of a composition such that its total solar radiation energy transmittance is greater than that of a similarly dimensioned substrate of ordinary soda-lime glass, and a coating at least partially covering at least one face of the substrate and being at least partially reflective of infrared radiation having a wavelength greater than 3μ.

44538 Solar energy absorber. Peterson, A.H. (to Hercules Inc.). US Patent 4,065,593. 27 Dec 1977. Filed date 14 Apr 1976. 6p.

A solar energy absorber is provided in which the absorber surface is comprised of a multiplicity of free ends of carbon or metallic fibers. The fibers forming the absorber surface are straight and are aligned in a parallel and side-by-side relationship. The small diameters of the fibers and the very close spacing of adjacent fibers of from 1 to about 10 micrometers provides a trap for solar energy. A solar energy absorbing device is also provided.

44539 Solar collector unit. Rapp, F. Jr.; Barron, J.M. (to DIY-Sol, Inc.). US Patent 4,062,346. 13 Dec 1977. Filed date 26 Jul 1976. 6p.

A solar collector unit is described including a corrugated absorber element coated with a reflectively selective coating; a plurality of thin, low mass, low thermal conductivity, thermal isolating elements for supporting the absorber element; and an insulation medium spaced from and generally parallel to the absorber element and disposed on a first side of the absorber element; a reflector surface carried on said insulation medium between said first side and the medium; and an inner transparent insulating sheet spaced from and generally parallel to the absorber element disposed on the second side of the absorber element for transmitting solar radiation to the absorber element and suppressing heat loss.

44540 Solar fluid heater. Lesk, I.A. (to Motorola, Inc.). US Patent 4,062,352. 13 Dec 1977. Filed date 14 Feb 1977. 4p.

A solar fluid heater includes a first planar surfaced collector for transmitting solar energy to heat a fluid located in a plurality of passages adjacently disposed to the collector. A honeycomb convection suppressor includes sidewalls orthogonally disposed to the planar surface of the collector for reducing convection heat losses. A selective coating disposed over the planar surface reduces radiation losses. Insulator material is disposed on the bottom side of the fluid carrying passages further minimizing losses from the heated fluid or water. In a dual sided fluid heater embodiment, another honeycomb conduction suppressor is disposed on the other side of the planar surfaced collector and direct and reflected solar energy is transmitted through both a top and bottom outer cover.

44541 Thermal panel for heating liquids. Hastwell, P.J. US Patent 4,062,351. 13 Dec 1977. Priority date 21 Jun 1974, Australia. 12p.

A solar generator panel is described in which a channel contains water, and has a cover which is transparent to solar radiation to allow solar radiation to pass into water in the channel whereby to absorb energy in the water from the radiation. An absorber for solar energy forms the front of said channel and is in contact with the water to absorb, as heat, that solar energy which passes through the water, and re-radiates and conducts such heat energy back to the water.

44542 Solar energy device. Gonzalez, E.E. US Patent 4,061,130. 6 Dec 1977. Filed date 28 Apr 1975. 6p.

A solar energy device is described for converting solar energy to a usable form of energy which includes a solar energy collector arranged adjacent a solar energy collector surface in sun energy transferring relation and tracking means to orient the face in perpendicular relationship to the sun rays.

44543 Solar heating. Harter, D.G. (to Solar Industries, Inc.). US Patent 4,060,070. 29 Nov 1977. Filed date 22 Jan 1976. 8p.

A heat collector and radiator is described for allowing the absorption of lower atmosphere radiation by the maximizing of the surface area capable of absorbing the diffuse radiation. A plurality of closely spaced tubular elements are disposed in parallelism with relatively narrow web portions interconnecting the adjacent tubular elements and in tangential relationship therewith. The structure is unitarily formed from a polymer material admixed with carbon black or like additive. A header means at each opposite end of the tubular elements/web portions communicates therewith. The structure is

selective in the respect that it has an emissivity lower than absorptivity, and is less effected by the incident angle.

44544 Wide angle solar heat collection system. Holt, F.S. US Patent 4,058,110. 15 Nov 1977. Filed date 5 Aug 1975. 6p.

A cylindrical reflector or lens is used under aberrated conditions in conjunction with an enlarged primary collector to obtain wide angle scanning performance that will allow concentration of solar radiation without extensive tracking.

44545 Solar heating and insulating apparatus. Gramm, R.J. (to Sunwall Incorporated). US Patent 4,058,109. 15 Nov 1977. Filed date 7 May 1976. 4p.

A combined solar heating and insulating apparatus is described for use on existing buildings or in new construction. The apparatus is inexpensive to manufacture and provides for auxiliary solar heating during the day and insulation during the night, both of which result in a savings in fuel and increased efficiency of the standard heating system of the building. The apparatus takes the form of panels which can be affixed to existing vertical southern walls with little or no modification, thus allowing for the use of solar energy without expensive physical modification to the building.

44546 Solar collector. Wendel, I.L. US Patent 4,058,111. 15 Nov 1977. Filed date 3 Feb 1976. 4p.

A solar collector adapted to be conveniently installed on a roof or similar structure includes a casing having a continuous bottom flange adapted to be secured to the roof and providing flashing for suitable roofing material. A continuous side wall extends upwardly from the flange and a continuous shoulder along the side wall and extends outwardly from a lower portion of the side wall to an upper portion thereof. A solar collector heat pan includes a generally flat heat plate having an upper face carrying typical tubing for a liquid to be heated by solar energy, the pan further having a continuous depending flange positioned on the casing shoulder with the plate substantially flush with the top edge of the casing. A light transmitting cover overlies the heat pan and has a continuous depending flange extending above the heat plate so that solar energy may engage the heat plate during relatively early and late daylight hours. The casing side wall is preferably solid and the cover flange extends about the upper portion of the side wall so that wind and foreign matter such as dust and precipitation are effectively prevented from entering below the heat pan within the cover.

44547 Solar heater. Barger, H.E. US Patent 4,056,093. 1 Nov 1977. Filed date 5 Dec 1975. 4p.

A solar heating unit is provided including an upwardly opening generally hemispherical double wall boiler including spaced inner and outer hemispherical walls defining a closed chamber therebetween in which to receive a liquid to be heated. An upwardly convex spherical lens structure is supported over the boiler and comprises a closure for the area enclosed within the boundaries of the inner hemispherical wall of the boiler and the lens assembly or structure functions to direct light rays incident thereon onto the inner wall of the boiler. The solar heater additionally includes a hollow downwardly opening transparent hemispherical cover of generally the same radius of curvature as the boiler and which is secured over the lens assembly in outwardly spaced position relative thereto with the center of curvature of the cover substantially coinciding with the center of curvature of the lens assembly. Water or other liquid inlet and outlet structure is provided on a second form of the invention for admitting liquid to be heated into the interior of the boiler between the inner and outer plates theeof and for withdrawing heated liquid from within the boiler.

44548 Solar heat collector. Henriques, F.C.; Pandolfo, J.P.; Lunde, P. (to Center for the Environment and Man). US Patent 4,056,090. 1 Nov 1977. Filed date 23 Feb 1976. 16p.

A solar heat collector is designed to obtain maximum heat from sunlight rays when operational and minimum heat from sunlight rays when non-operational. The solar heat collector contains two sheets of solid material spaced and confronting each other between which a heat transfer liquid flows through a baffle arrangement so as to increase the efficiency for obtaining higher temperatures of the heat transfer liquid.

44549 Portable linear-focused solar thermal energy collecting system. Miller, C.G.; Pohl, J.G. US Patent 4,051,834. 4 Oct 1977. Filed date 28 Apr 1976. 12p.

A solar heat collection system is provided by utilizing a line-focusing device that is effectively a cylindrically curved concentrator within a protected environment formed by a transparent inflatable casing. A target, such as a fluid or gas carrying conduit is positioned within or near the casing containing the concentrator, at the line focus of the concentrator. The casing can be inflated at the site of use by a low pressure air supply to form a unitary light weight structure. The collector, including casing, concentrator and target, is readily transportable and can be used either at ground level or on rooftops. The inflatable concentrator can be replaced with a rigid metal or other concentrator while maintaining the novel advantages of the whole solar heat collection system.

44550 Highly efficient solar collector including means for preventing cover plate fluid condensation. Root, E.F.; Kunica, S.; Simmons, H.M. (to Itek Corp.). US Patent 4,046,135. 6 Sep 1977. Filed date 30 Jan 1976. 4p.

A solar energy collector of low cost and high thermal efficiency is disclosed having a heat trap produced by zigzagging a thin strip of polyethylene terephthalate between opposite sides of the trap while wrapping the strip about rows of dowels positioned at opposite sides of the frame of the solar collector. A window of soda lime glass filters uv radiation to inhibit discoloration of the plastic heat trap walls. An absorber plate having fluid pipes therein is positioned underneath the heat trap and a first layer of fiberglass, and a second layer of polyurethane foam are positioned below the absorber plate. The fiberglass layer prevents overheating of the polyurethane foam layer to in turn inhibit the formation of toxic fluids, which may condense upon the underside of the window to reduce the efficiency of the collector.

44551 Vented solar collector. Scharfman, H. (to Raytheon Co.). US Patent 4,043,317. 23 Aug 1977. Filed date 2 Jul 1976. 6p.

A solar collector is described of the type embodying a collector plate with fluid conduits disposed in heat-conductive relation to the plate, and a transparent cover spaced above the plate-conduit assembly, with venting devices being provided in opposite end portions of the assembly for permitting cool air circulation within the space between the plate and cover to maintain the temperature of the collector below an established level.

44552 Transmission solar focusing collector. Demichelis, F.; Russo, G. (Politecnico di Torino (Italy)). *Lett. Nuovo Cim.;* **19**: No. 5, 145-151(4 Jun 1977).

In this letter is described a TIR-total internal reflection-solar collector, with a concentration ratio of about 40-output temperature required, 250deg. The collector is made of metacrylate "roof" type (Amici) prisms; the engineering of the collector is described and a proper suntracking system is identified.

44553 Investigations of the corrosion behaviour of aluminium rollbond absorbers. Weidemann, R. (Metallgesellschaft A.G., Frankfurt am Main (Germany, F.R.). Metall-Laboratorium). pp 273-278 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 26: Materialfragen. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Roll bond Aluminium Al 99.3 or the alloy AlMn 1.5 are good materials for solar collectors. For undisturbed long term operation of the collectors their corrosion resistance is a significant factor. No problems arise in an appropriate coating of the outside surfaces, but the behaviour of the inside surfaces with regard to the heat transport medium and other metals found in this medium is important. This paper reports on several corrosion experiments on Aluminium in which various water-based and non-water heat transport media, both with and without contact with copper, were carried out.

44554 Zinc, its properties and its applicability for solar technology. Overkamp, K.H. (Rheinisches Zinkwalzwerk G.m.b.H. und Co. K.G., Datteln (Germany, F.R.)). pp 279-288 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 26: Materialfragen. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The optimal positioning of flat plate collectors for an unhindered collection of solar energy invariably leads to the problem that the solar collector is subjected to corrosion due to the atmospheric exposure. Therefore only proven, but inexpensive construction materials which have long lifetimes along with minimal maintenance requirements should be used. An appropriate construction material is zinc. The introduction of this proven material is described for a case to show how one can make use of the material characteristics to integrate the solar collectors into roofs appropriate for this purpose.

44555 Organic heat transfer fluid for solar circuits. Pieper, F.W. (Rhone-Poulenc Chemie G.m.b.H., Frankfurt am Main (Germany, F.R.)). pp 289-302 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 26: Materialfragen. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

A basic discussion of requirements to be made on a liquid heat carrier for solar circuits is followed by the introduction of a synthetic product as an organic heat carrier. This heat carrier is also suitable for the heat exchange in a salt hydrate-latent heat storage system. For applications at higher temperatures, too (e.g. in solar power

plants), suitable organic heat carriers (e.g. terphenyle) can be recommended. Finally, methods for testing the thermal resistance of the heat carrier oils are described.

44556 Sealing problems in solar collectors. Faesel, J. (Metallgesellschaft A.G., Frankfurt am Main (Germany, F.R.)). pp 303-307 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 26: Materialfragen. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

In order to protect the efficiency of absorbing surfaces in solar collectors over a long period of time the housing has to be sealed hermetically. In the following, different sealing materials are discussed, which can be utilized for this purpose.

HEAT STORAGE

REFER ALSO TO CITATION(S) 44464, 44498, 44505, 44841, 44847

44557 Application of latent-heat storage element in solar-heated buildings. Lammers, J. *Fertigteilb. Ind. Bauen.;* **11**: No. 3, 26-30(1976). (In German).

In-line arrangement of latent-heat storage elements is of particular importance when solar energy is used for heating in order to overcome the seasonal difference between solar energy supply and the possibility to utilize this solar energy. Latent-heat accumulators with accumulator masses of anorganic salt hydrates and special organic compounds are particularly suitable. The possible applications are illustrated by examples of existing solar houses. A conception for an integration of latent-heat storage masses in lightweight walls may directly influence the architectural design.

44558 (CONF-761220—, pp 23) **Geothermal storage of solar energy for electric power systems.** Collins, R.E. (Univ. of Houston, TX); Davis, K.E. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44559 (CONF-761220—, pp 25) **Economics of internal and external energy storage in solar energy applications.** Manvi, R. (California State Univ., Los Angeles). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44560 (CONF-761220—, pp 27-34) **Some experimental data for thermal pile energy storage.** Sayigh, A.A.M.; Shaalan, M.R. (Univ. of Riyadh, Saudi Arabia). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

An extensive study was carried out on thermal pile storage of various rocks and water in closed containers. A theoretical analysis and some experimental results are presented. A table is given showing specific heat, density, thermal diffusivity, and thermal conductivity for several storage materials. (MHR)

44561 (CONF-761220—, pp 35-39) **Long duration earth storage of solar energy.** Yuan, S.W.; Bloom, A.M.; Nazli, M. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

The heat transfer characteristics of long-duration storage of solar energy in an earth reservoir are analyzed. Solar collectors provide heat input to the earth storage. A water pipe heat exchanger is used. Two approaches are used for the theoretical analysis: a first order solution for the heat transfer between the soil and water pipe and the second assuming unsteady radial heat conduction in the soil region and two-dimensional unsteady turbulent heat transfer in the pipe flow. It is calculated that year round solar collection and one acre of earth storage is adequate to provide space heating for twelve average size houses in most areas of the United States. (MHR)

44562 (CONF-761220—, pp 42-44) **Development of latent heat of fusion type materials.** Kando, P.F.; Telkes, M. (Univ. of Delaware, Newark). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Heat of fusion storage materials and the research on these materials at the University of Delaware are discussed briefly. A comparison between various thermal storage materials is shown. Properties and cost of several salt hydrate thermal energy storage materials for space conditioning are tabulated. (MHR)

44563 (CONF-761220—, pp 45-46) **Prediction of melting rate in a solar energy storage sub-system utilizing latent heat.** Oezlsik, M.N.; Mody, K.J. (North Carolina State Univ., Raleigh). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

A method of analysis is presented for the determination of the rate of melting of the phase change material and the variation of the temperature of the circulating fluid as a function of time and position along the channel. The approach for solving the coupled system of partial differential equations is described. (MHR)

44564 (CONF-761220—, pp 85-91) **Laboratory solar pond.** Chen, C.F.; Thangam, S.G. (Rutgers—The State Univ., New Brunswick, NJ). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Experiments were carried out in a laboratory solar pond both with constant and intermittent radiant energy input. A numerical integration procedure has been developed to predict the temperature and density distribution in the tank. The theoretical results agreed well with experimental values. The computer program was then modified for actual solar radiant energy input, and was used to predict the performance of solar ponds at Tucson, Arizona and New Brunswick, New Jersey. (MHR)

44565 Storage of solar energy. Necessity and some principles. Roters, K. *Mitteilungsbl. Dtsch. Ges. Sonnenenergie;* **2**: No. 5, 7-8(Sep 1977). (In German).

The article deals with the possibilities of converted solar energy storage. Apart from the storage of heat that can be felt, latent heat storage is discussed. Chemical storage systems are dealt with, too. The concept of a thermochemical heat pump is mentioned.

44566 Storage of solar energy in the ground. Uiblacker, K. pp 31-38 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 22: Speicherung, fuehlbare Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The wide spread production of solar energy utilization devices has been hindered up to now due to the high cost of sensible heat storage over seasonal time periods. Considerations on concepts for economical seasonal heat storage have led to the use of an open system with air as the heat transport medium and with 'Mineral' as the storage medium. The thermal heat storage possibilities are examined in a conceptional study.

44567 Solar energy - competitive because of cascade batteries. Laing, N. (Latent-Energie G.m.b.H. und Co. Entwicklungs-K.G., Remseck (Germany, F.R.)). pp 41-74 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 23: Speicherung, latente Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Optimum solar energy utilisation requires heat storage cascades. The solar heat of the collectors is directed via a latent heat storage device which acts as a buffer to a cycle accumulator where it is temporarily stored. It is then fed to a long period storage accumulator. In this manner, the costs of generating heat which is 'stored in the summer - consumed in the winter' are considerably less than oil heating costs. Even today, using cascade batteries, solar electricity which is 'stored in the south - consumed in the north' can compete with nuclear power.

44568 Solar heating system for greenhouses using LAING latent-energy storages. Lauther, S. (Latent-Energie G.m.b.H. und Co. Entwicklungs-K.G., Remseck (Germany, F.R.)). pp 253-262 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 25: Landwirtschaftliche Nutzung von Sonnenenergie. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The latent energy storages are able to release heat at nearly the same temperature at which it is absorbed. The first commercial application in combination with solar energy is a heating system for greenhouses. A fan ensures that the excess heat accumulated as a result of solar radiation is fed to a latent-energy storage. By crystalization the heat is released during the night thus heating the inside of the greenhouse. The new system is able to supply heat at about 40% of the price of oil heating.

GEOTHERMAL ENERGY

RESOURCE STATUS AND ASSESSMENT

44569 (NP—22160) **Active volcanoes and their relation to geothermal energy.** Viramonte, J.G. (Universidad Nacional de Cordoba (Argentina). Departamento de Ciencias Geologicas). [nd]. 4p. (In Spanish). Dep. NTIS (US Sales Only), PC A02/MF A01.

By the use of slides depicting active volcanism, particularly that of Cerro Negro in Nicaragua, an attempt is made to illustrate that volcanism is the result of endogenic process which can be exploited as geothermal energy. (JSR)

USA

44570 (AD-A—046954) **Exploration for geothermal energy on Oahu, Hawaii. Final report.** Keller, G.V.; Souto, J.; Furumoto, A.B. (Colorado School of Mines, Golden (USA). Dept. of Geophysics). 10 Nov 1977. Contract N00014-76-C-0824. 41p. NTIS PC A03/MF A01.

Most interest in geothermal development in Hawaii up to the present time has centered on the development of thermal energy at Kilauea Volcano on the Island of Hawaii. Several test wells have yielded encouraging results with respect to further development of geothermal energy (Keller, et al, 1974). However, nearly 80% of the population of Hawaii reside on the Island of Oahu. In view of the larger market for energy there, it is reasonable to review the potential for the occurrence of commerical geothermal resources on Oahu.

NON-USA

REFER ALSO TO CITATION(S) 44582, 44589

44571 (NP—22301) **Report of geothermal multi-purpose utilization inspection tour.** Tokosugu, T. (Japan Geothermal Energy Association, Tokyo). Nov 1975. 105p. (In Japanese). TIC.

Portions of document are illegible.

An inspection tour group from Japan was organized to investigate how other countries utilize geothermal energy. It consisted of scholars, local government officers and experts from related industries. Twenty-six persons were involved. They left Tokyo in July 1975, and spent three weeks visiting Iceland, Hungary, Italy and France. They reported on geothermal surveying, multi-purpose utilization, how water transportation, electrical power generation, policy management, plans for future development and solution of environmental problems. They recommended that basic research on environmental, hydrological, geological, geophysical and geochemical aspects of geothermal energy be conducted.

44572 (NP—22850) **Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I.** (Instituto Costarricense de Electricidad, San Jose; Rogers Engineering Co., Inc., San Francisco, Calif. (USA)). Dec 1976. 76p. TIC.

Portions of document are illegible.

Geologic mapping of some 500 square kilometers was done at a scale of 1:50,000, giving emphasis to stratigraphy and geologic history, regional and local structure, and details of hydrothermal alteration, all designed to provide information on a potential geothermal reservoir and heat source. Mapping was supplemented by microscope study of rocks in thin-section; radiometric age-dating of selected rocks; chemical analysis of selected rocks; photo-geologic interpretation of structures; reconnaissance evaluation of formations outside of the target area that might have bearing on a deep reservoir; and logging of cores from holes drilled for temperature-gradient purposes. The principal product has been maps, cross sections, and tabulated data. Geochemical sampling was carried out at thermal springs and fumaroles, and non-thermal springs and wells for chemical analysis. Analyses stressed major cations and anions, plus silica, fluorine and boron. Gases from fumaroles were analyzed also. Data were tabulated, plotted on maps and treated statistically, using computer programs, to determine patterns of ground-water circulation, including possible reservoir temperatures and chemical quality in a deep geothermal reservoir. Data on regional and local climatology and surface-water hydrology were collected, and integrated in a series of maps and tables, to reveal ground-water conditions in the project area. A survey of the gravity field was made across an area of 500 square kilometers. A series of approximately 60 Schlumberger-array soundings of electrical resistivity were carried out along pre-selected lines at spacings of 1,000 meters, to supplement the Wenner-array soundings. Approximately 35 holes were drilled for purposes of measuring temperature gradient and calculating heat flow across the study area. Heat-flow values were calculated from thermal gradient and conductivity measurements. (JGB)

44573 (UCRL-Trans—1547) **Geothermal field of Cerro Prieto on the San Jacinto Fault and its possible extension towards the Imperial Fault.** Soto, P.S. (Mexican Bureau of Power, Mexicali). Jan 1978. Translation of Mexican internal report, 1975. 31p. Dep. NTIS, PC A04/MF A01.

Discussion is presented under the following section headings: background history; introduction course of the San Jacinto Fault and its doubtful continuation towards the zone of the geothermal field; Well 53; structural geology of the geothermal field of Cerro Prieto; production of the zone being exploited; quake of May 18, 1940; possibilities of other geothermal deposits in the Valley of Mexicali; general exploitation; conclusions; and, recommendations. The Cerro Prieto can be divided by size of production into two zones. The first zone corresponds structurally to a secondary branch of the San Jacinto Fault. The second zone, located with the drilling of Well 53 in 1974, is located over the main body of the San Jacinto Fault. It is suggested that additional exploration be carried out with deep wells at the crossing of the Cerro Prieto and Imperial Faults. (JGB)

GEOLOGY, HYDROLOGY, AND GEOTHERMAL SYSTEMS

NON-USA

REFER ALSO TO CITATION(S) 44572, 44583

44574 (CONF-7610123—6) **Analysis of interrelation of hot spring waters using a multi-component concentration correlation matrix.** Kiba, T.; Terada, K.; Matsumoto, K. (Corporate Unverified). 1976. 1p. (In Japanese). TIC.

From Annual meeting of the Geochemical Society of Japan; Nagoya, Japan (25 Oct 1976).

Portions of document are illegible.

The concentration correlation matrix method takes the ratios of various components of chemical samples and compares them in such a way as to derive specific correlations. Using previously tabulated data concerning eighty hot springs in Ishikawa prefecture this method was applied and conclusions were drawn concerning the origins of the hot springs and the role of sea water in their formation. The Awatsu springs in Ishikawa have historically been believed to arise from a single source. As a result of this study, however, they were shown to derive from two distinct sources with subsequent mixing.

44575 (NP—22841) **Problems of geothermics using the Rhinegraben as an example.** Werner, D. (Karlsruhe Univ. (TH) (Germany, F.R.)). 16 May 1975. 177p. (In German). Dep. NTIS (US Sales Only), PC A09/MF A01.

The geothermal situation in the Rhinegraben is characterized by a high average heat flow of 2—3 HFU and strong local fluctuations of the field. The fluctuation of the field is due to the circulation of water, for which a mathematical model is presented. Interpretations of the heat flow anomaly by simple static models comprising thermal conductivity, distribution, radiogenic heat sources, and intrusive masses fail to adequately explain the phenomenon. Dynamic models have been created to explain how geothermal fields are distorted as a result of fluid motion. Geothermal effects at the surface can only be explained on the basis of motions at the base of the crust. These motions must have a magnitude of about 1 mm/yr over a period of about 10^7 years. This model raises three questions. How does the crust-mantle boundary behave during motion with respect to density. What is the influence of temperature distribution caused by ascending hot masses on the gravitational field. How does the model conform to earthquake measurements. Another concept which may explain the temperature anomalies is that of hydrologic circulation. The possibility of exploiting the resources of the Rhinegraben are discussed in the conclusions. Seventy-eight references are provided.

44576 (NP—23011) **Guanacaste Geothermal Project. Technical prefeasibility report. Annex E. Geohydrology.** (Instituto Costarricense de Electricidad, San Jose; Rogers Engineering Co., Inc., San Francisco, Calif. (USA)). Dec 1976. 164p. (In Spanish). Dep. NTIS, PC A08/MF A01.

Portions of document are illegible.

This report is the fifth of six annexes to the Summary Report on the First Phase of the Guanacaste Geothermal Project. The studies covered an area of 500 km^2 on the SW flanks of the Rincon de la Vieja and Miravalles volcanoes of the Guanacaste Volcanic Range in NW Costa Rica, and were aimed at locating zones of high geothermal gradient, and reconstruction of the stratigraphic column. An estimate was made of the annual and low-water mark water reserves. Balances were also made for each basin taking into consideration precipitation, evapo-transpiration, and runoff. Determina-

tions were also made of effluent and influent stream, recharge, and deep water circulation zones, and water tables. An underground flow pattern was observed, extending from the volcanic massifs where recharge takes place, to the plains near the Panamerican Highway. Using silica, specific conductivity, and chlorides as natural tracers, it was concluded that the underground and surface drainage patterns generally coincide. In the area around the Miravalles volcano, a zone was found near the township of Guayabal where seepage of deep waters appears to take place, showing high silica and chloride contents (more than 150 and 50 ppM respectively), and high conductivity (more than 500 mhos-cm). Springs with low mineral content, which could be associated with shallow circulation waters, are also present in this zone. This could be indicative of the existence of two horizons, a cold one above and a hot one below, separated by an impermeable layer. Another instance of seepage of deep waters is observed in the zone around the township of Salitral de Bagaces and the Aguas Calientes River. In the northeastern part of the area under study, it was observed that the underground drainage pattern conforms to the surface drainage of the Salitral and Tizate rivers.

44577 (NP—23014) **Guanacaste Geothermal Project. Technical prefeasibility report. Annex A. Geology.** (Instituto Costarricense de Electricidad, San Jose; Rogers Engineering Co., Inc., San Francisco, Calif. (USA)). Dec 1976. 172p. (In Spanish). Dep. NTIS (US Sales Only), PC A08/MF A01.

Portions of document are illegible.

This report is the first of six annexes to the Summary Report on the First Phase of the Guanacaste Geothermal Project. The studies covered an area of 500 km² on the SW flanks of the Rincon de la Vieja and Miravalles volcanoes of the Guanacaste Volcanic Range in NW Costa Rica, and were aimed at locating zones of high geothermal gradient, and reconstruction of the stratigraphic column. Geothermal activity is closely related to recent volcanic activity that led to the emergence of the volcanic range. The zones of surface activity lie on a NW-SE trend, which is also the trend of an important regional faulting system of Pliocene age. A deeper, older faulting and fracturing system on an E-W trend may also favor geothermal accumulations with industrial potential. The stratigraphic column in the vicinity of the zones of geothermal activity consists mainly of pyroclastics overlying the lavas. The pyroclastics, when subject to rapid alteration, may constitute an impermeable seal in geothermal reservoirs. Lavas and ignimbrites of greater rigidity than tuffs exhibit interesting permeability features through fracturing and jointing. In areas where this type of lithology occurs in large volumes, geothermal reservoirs with industrial potential might be found. The recharge area for the geothermal fields associated with the magmatic reservoirs of the Guanacaste Volcanic Range may be located in the highly fractured, recent lavas outcropping on the flanks of the volcanoes. On the Nicoya peninsula, sediments outcrop at relatively short distances (35 km) from the zones of geothermal activity, and disappear under thick volcanic layers in the direction of the volcanic range, their further extent being unknown.

GEOTHERMAL EXPLORATION AND EXPLORATION TECHNOLOGY

GEOPHYSICAL TECHNIQUES AND SURVEYS

REFER ALSO TO CITATION(S) 45432

44578 (CONF-7608107—1) **Geothermal energy.** Hayakawa, M. (Corporate Unverified). 1976. 17p. (In Japanese). TIC.

From Summer energy conversion technology meeting; Tokyo, Japan (Aug 1976).

Portions of document are illegible.

This paper theorizes the supply and radiation of geothermal energy and provides an historical background, and a description of heat flow from the Earth's mantle to the upper crust, plate tectonic theory, volcanic activity and earthquakes. Also covered are radioactive decay, the formation of oil and coal, mineralization, deep energy sources and expansive energy production. It is calculated that the energy produced by these mechanisms amounts to 1.8×10^{8} erg/yr by heat flow and conduction from mantle to crust, energy radiation of earth movement equal to 10^{26} erg/yr, and explosion of Japanese volcanoes equal to 7×10^{23} erg/yr. Worldwide radioactive decay is estimated at 8×10^{27} erg/yr. Other estimates are 10^{27} for oil, 10^{27} for coal, 1.8×10^{26} for mineralization and 4×10^{28} for Earth expansion. It is concluded at the extractable volcanic energy available is only 1/10,000 of the total energy transferred from mantle to crust, indicating that tremendous thermal energy exists under the earth as hot rock or in other forms.

44579 (LBL—6815) **Assessment of surface geophysical methods in geothermal exploration and recommendations for future research.** Goldstein, N.E.; Norris, R.A.; Wilt, M.J. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). 1978. Contract W-7405-ENG-48. 170p. Dep. NTIS, PC A08/MF A01.

The four classes of geophysical methods considered are: passive seismic methods; active seismic methods; natural field electrical and electromagnetic methods; and, controlled-source electrical and electromagnetic methods. Areas of rsearch for improvement of the various techniques for geothermal exploration are identified. (JGB)

44580 (NP—22785) **Seismic research in the Larderello area: first results.** Bernardi, A.; Cameli, G.M.; Romanini, E.; Squarci, P.; Stefani, G. (Compagnia Mediterranea Prospezioni, Rome (Italy); Ente Nazionale per l'Energia Elettrica, Pisa (Italy). Centro di Ricerca Geotermica; Societa Italiana Applicazioni Geofisiche, Milan (Italy); Consiglio Nazionale delle Ricerche, Pisa (Italy). Istituto Internazionale per le Ricerche Geotermiche; Ente Nazionale per l'Energia Elettrica, Florence (Italy)). 1976. 31p. (In Italian). Dep. NTIS (US Sales Only), PC A03/MF A01.

The history of research performed at the Larderello geothermal field since 1926 is summarized. In order to investigate the deep strata which contain the majority of the steam, it was necessary to develop new exploratory techniques. Due to the complicated structure of the formations which surround the aquiferous beds, traditional methods of geo-electrics and magneto-telluric surveys are of limited usefulness. Methods employing seismic reflectometry seem to be most effective. Previous geological and structural research in Tuscany made possible stratigraphic reconstruction and structural-tectonic mapping of the basement at Larderello. Based on derived data, it was concluded that a major geothermal anomaly existed at a depth which was not being reached by exploratory drillings. Seismic reflectometry supported this hypothesis.

44581 (NP—23012) **Guanacaste Geothermal Project. Technical prefeasibility report. Annex C. Electric resistivity.** (Instituto Costarricense de Electricidad, San Jose; Rogers Engineering Co., Inc., San Francisco, Calif. (USA)). Dec 1976. 213p. (In Spanish). Dep. NTIS (US Sales Only), PC A10/MF A01.

Portions of document are illegible.

This report is the third of six annexes to the Summary Report on the First Phase of the Guanacaste Geothermal Project. The studies covered an area of 500 km² on the SW flanks of the Rincon de la Vieja and Miravalles volcanoes of the Guanacaste Volcanic Range in NW Costa Rica, and were aimed at locating zones of high geothermal gradient, and reconstruction of the stratigraphic column. The formations in the area under study can be grouped into six resistivity ranges, varying from less than 5 to more than 200 ohm-meters. Values from 200 to as high as 30,000 ohm-meters generally correspond to fractured and porous lavas, their fracturing and porosity, as well as their drainability, increasing with resistivity. The values above 100 ohm-meters were recorded in zones of recent lava flows, in spurs of the volcanoes Rincon de la Vieja and Santa Maria, and in the slopes of the Miravalles volcano, and correspond to shallow formations (maximum depths of 150 meters) which may constitute recharge zones for the underground aquifiers. The values in the 100 to 200 ohm-meter range were generally recorded directly under layers constituted by drained, porous lavas, or under shallow layers where no recent lavas are present. The third group comprises materials with resistivities in the 25 to 100 ohm-meter range, occurring at two different depth levels: a deep one (more than 1000 meters) and a shallow one (less than 400 meters). Resistivities less than 25 ohm-meters were recorded at depths of 250 meters and more, and may correspond to material typical of the Aguacate formation, which probably constitutes the reservoir rock of the geothermal fluids. In order to locate the zones of most geothermal interest, this range was classified into the three remaining of the six groups, viz 10 to 25, 5 to 10, and less than 5 ohm-meters, the last group appearing to be that of greatest geothermal potential.

44582 (NP—23015) **Guanacaste Geothermal Project. Technical prefeasibility report. Annex F. Heat flow.** (Instituto Costarricense de Electricidad, San Jose; Rogers Engineering Co., Inc., San Francisco, Calif. (USA)). Dec 1976. 98p. (In Spanish). Dep. NTIS (US Sales Only), PC A05/MF A01.

Portions of document are illegible.

This report is the sixth of six annexes (designated A through F) to the Summary Report on the First Phase of the Guanacaste Geothermal Project. The studies covered an area of 500 km² on the SW flanks of the Rincon de la Vieja and Miravalles volcanoes of the Guanacaste Volcanic Range in NW Costa Rica, and were aimed at locating zones of high geothermal gradient, and reconstruction of the stratigraphic column. The three areas that have the highest geothermal resource potential were investigated for heat flow. They are the zones of Las Hornillas on the slopes of the Miravalles volcano, Las Pailas on the slopes of the Rincon de la Vieja volcano and, to a lesser extent, the zone of Borinquen. A total of 2500 meters were drilled in 35 thermal gradient wells. Of these, 27 wells were drilled in the Las Hornillas zone, 7 in Las Pailas, and only 1 in Borinquen. In the Las Hornillas zone of the Miravalles volcano, the

temperature-vs.-depth profiles exhibit a higher slope in areas near the fumaroles, decreasing toward the interior of the caldera. This determines a zone of high slope curves coinciding with the 1000°C/km gradient contour. In the most significant well, temperatures above 150°C were recorded. Since this location was selected on the basis of the results of all the other studies, it is felt that a fair knowledge of the thermal flow pattern of this area has been obtained. Drilling of an additional gradient well about 200 m in depth, located on the 1000°C/km contour, would adequately complement the information on this zone. The shallow gradient wells did not detect any significant result when located away from the zones of fumarole activity. (JGB)

44583 (NP—23016) **Guanacaste Geothermal Project. Technical prefeasibility report. Annex D. Gravimetry.** (Instituto Costarricense de Electricidad, San Jose). Dec 1976. 36p. (In Spanish). Dep. NTIS (US Sales Only), PC A03/MF A01.

This report is the fourth of six annexes to the Summary Report on the First Phase of the Guanacaste Geothermal Project. The studies covered an area of 500 km^2 on the SW flanks of the Rincon de la Vieja and Miravalles volcanoes of the Guanacaste Volcanic Range in NW Costa Rica, and were aimed at locating zones of high geothermal gradient, and reconstruction of the stratigraphic column. The primary objective of the gravimetric study was to aid in defining known or inferred geological structures, including faults, intrusions, and stratigraphic units of low density. A secondary objective was to uncover subsurface structures not evident from the geological mapping. Both objectives were achieved. The main geologic structures indicated by the study are: (1) A complex, roughly circular principal low, indicating an ancient caldera, whose western half forms the level, closed Los Llanos depression north of Guayabo. (2) A series of discontinuous, thin highs, suggesting a similarly discontinuous series of hypabissal intrusions along the rim of the ancient caldera. These are found in the Santa Rosa area, immediately to the east of Las Hornillas. (3) Smooth variations south of the Guanacaste Range indicate that the combined tuffs of Liberia and Bagaces have thicknesses varying from 200 to 700 meters, their greatest thickness occurring in a closed depression near the Potrero River north of the Panamerican Highway. Low gravity troughs extend north and south of this depression, suggesting ancient, tuff-filled canals. The postulated caldera and its associated intrusions are particularly significant in geothermal prospecting, suggesting the possibility of a geothermal reservoir in the faulted rocks of the caldera's exterior zone, and a thermal source in the young intrusions, as well as its lowermost limits.

44584 (SAN—0936P48-1) **Formation temperature gauge feasibility study. Volume II.** (IRT Corp., San Diego, Calif. (USA)). 9 Mar 1977. Contract EY-76-C-03-0936-048. 55p. Dep. NTIS, PC A04/MF A01.

The present status of the formation temperature gauge feasibility study is reported. It also demonstrates the feasibility of the technique in the simplified situations examined to date both analytically and experimentally. The first section deals with the theory underlying the technique. The next three sections describe the temperature gauge, the simplified model calculations of the gauge response, and the preliminary experimental measurements performed to verify the results of the computational study. The final section describes the formation temperature test stand designed to demonstrate the feasibility of the technique in the geothermal well geometry. This test stand has been assembled and measurements of the gauge response will begin shortly. These are outlined at the end of this report.

44585 **Geothermal energy and the lithosphere in the south-west of FRG/Switzerland.** Werner, D. (Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Geophysik). *Naturwissenschaften;* **64**: No. 12, 626-631(Dec 1977). (In German).

A geothermal survey of the Central Alps, the Swabian volcano, and the Rhinegraben area is presented. New results from seismic surface-wave investigations are used to estimate temperatures at the base of the lithosphere. Cross sections show the high position of the 1,000°C isotherm under the Rhinegraben in relation to its surroundings.

GEOCHEMICAL TECHNIQUES AND SURVEYS

44586 (CONF-7410177—3) **Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields.** Koga, A.; Noda, T. (Corporate Unverified). 1974. 1p. (In Japanese). TIC.

From Annual meeting of the Geochemical Society of Japan; Tokyo, Japan (3 Oct 1974).

In order to obtain further scientific information in fields where the geological structures are already known to some extent, an investigation was made concerning the boron, arsenic and mercury present in the altered clays of the Otake and Hatchobaru geothermal fields. Also studied were the B, As, Hg, F, and NH_3 present in the fumarolic gas and water of the Kokonoe san system. The altered clay in the Otake and Hatchobaru fields is classed into alunite, kaolinite and montmorillonite. The Hg content of the clay runs from 0.1 to 67.9 ppM, a concentration much higher than found in unaltered rock (0.65 to 2.55 ppM). In addition, this enrichment trend appeared along distinct geographic lines, probably indicating the existence of a fault. The Hg and As adsorb into the clay in the form of sulfides.

44587 (CONF-7610123—5) **Geochemical geothermal exploration in Noya geothermal field.** Noda, T.; Kaga, A. (Corporate Unverified). 1976. 1p. (In Japanese). TIC.

From Annual meeting of the Geochemical Society of Japan; Nagoya, Japan (25 Oct 1976).

The Yano area in Oita prefecture is a typical geothermal steam field. Exploration was conducted by analysis of the present steam and hot springs and analysis of chemical compounds in the river water. Measurements were made of pH, silver sulfate, Hg in liquid, and Hg and CO_2 in air (soil). The highest amount of Cl in the area was 3.83 ppM. The temperature calculated from cation concentrations is low for this type of spring (11 to 62°C). The steam contained 4.7 ppB Hg. In the river water analysis correlations between location and compounds present were determined by a multi-component matrix. Some compounds proved reliable geothermal indicators, notably Hg. The pH ranged from 4.3 to 6.2 and there were few sulfur compounds present. CO_2 in soil air was 0.1 to 6.0% and the Hg concentration was high.

44588 (NP—22298) **Hot spring and volcanic gas of Ogasawara Ioo Island.** Takaesu, K.; Ozawa, T.; Hirabayashi, J.; Kosaka, J. (Corporate Unverified). 1975. 1p. (In Japanese). TIC.

From Annual meeting of the Geochemical Society of Japan; Osaka, Japan, 23 Oct 1975. Portions of document are illegible.

A chemical analysis of volcanic gas and the hot springs of Ogasawara Ioo Island was made. There are two volcanoes on the island. The high temperature region is distributed evenly, with two or three hot springs with temperatures in excess of 100°C. HCl and SO_4 were not detected, indicating that the volcanoes are not active. It can be expected that good geothermal resources exist beneath the island as H_2 gas is detected in radon gas samples (indicating subterranean activity). The spring analysis showed two categories of hot springs. One of them showed Cl ion to be much less than SO_4 ion and the other had much less Ca ion than Mg ion.

44589 (NP—23013) **Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry.** (Instituto Costarricense de Electricidad, San Jose; Rogers Engineering Co., Inc., San Francisco, Calif. (USA)). Dec 1976. 43p. (In Spanish). Dep. NTIS (US Sales Only), PC A03/MF A01.

Portions of document are illegible.

This report is the second of six annexes to the Summary Report on the First Phase of the Guanacaste Geothermal Project. The studies covered an area of 500 km^2 on the SW flanks of the Rincon de la Vieja and Miravalles volcanoes of the Guanacaste Volcanic Range in NW Costa Rica, and were aimed at locating zones of high geothermal gradient, and reconstruction of the stratigraphic column. The chemical characteristics of the springs in the area lead to the expectation of a water-steam geothermal system. Total dissolved solids in the fluids should range from 8000 to 15000 ppM, with NaCl the main constituent. Geothermometers indicate that temperatures from 200 to 240°C should be expected. The Miravalles area appears to be the most promising one of those studied. The coexistence of cold and hot springs in the Guayabo-La Fortuna (Miravalles) zone may indicate the existence of a shallow, cold aquifer and a deeper, hot one, separated from each other by some impermeable, thermally insulating horizon. The hydrology of the Las Pailas zone is somewhat complex. There appears to exist a geological barrier to the egress of possible geothermal brines in the direction of Liberia, and that the latter would discharge through the Salitral river. The gas content of the fumaroles is fairly uniform throughout the different areas (Miravalles, Las Pailas, and Borinquen). The main constituents are CO_2 and H_2S. On the basis of the studies completed so far, it is conceivable that the areas of Las Pailas and Borinquen may be related to a single geothermal system discharging through the Salitral river.

44590 **Geochemical studies on the thermal brine from Reykjanes (Iceland).** Olafsson, J.; Riley, J.P. (Univ. of Liverpool). *Chem. Geol.;* **21**: No. 3-4, 219-237(Feb 1978).

Chemical and isotopic (D and ^{18}O) analyses are presented for thermal brines from three springs and two boreholes on the Reykjanes peninsula. They suggest that the discharge waters are formed mainly by the penetration of local meteoric water into brine-bearing formations followed by evaporation of this brine. As postulated by Bjornsson et al. (1970), this evaporation probably occurs relatively close to the surface in the thermal area during the convectional cycling of the brine. The ionic composition of the original seawater is probably modified by equilibria involving secondary minerals;

thus, sulfate and fluoride concentrations are probably controlled by the solubility of anhydrite and fluorite, respectively.

EXPLORATORY DRILLING AND WELL LOGGING

REFER ALSO TO CITATION(S) 44570

44591 (NP—22302) **Record of drilling of Hachimandaira Onuma well 0-3(R)a.** (Mitsubishi Metal Corp., Tokyo (Japan)). Jan 1970. 16p. (In Japanese). TIC.

The Hachimandaira Onuma geothermal exploitation well was begun in July 1969 and completed in November of that year. At the drilling site the surface was covered by soft soil. The first 30 m consisted of clay and boulders followed by a soft gray tuff. At 100 m a greenish brown shale was encountered and from 100 to 400 m heavily heat altered tuff with pyrite tint was cored. This was followed by increasingly harder rock such as volcanic conglomeratic tuff, tuff breccia, andesite and dacite. From 1 km onward the rock became harder and demonstrated pyrite dissemination in andesitic tuff. Coring was performed 19 times during the drilling (every 50 to 100 m) and temperatures were measured 3 times at 555 m and twice at 1485 m. The maximum temperature was 193°C but it abruptly fell off at about 1450 m. Finally, a swabbing resulted in a successful fumarole.

ECONOMIC AND FINANCIAL ASPECTS

REFER ALSO TO CITATION(S) 44596, 44597

ENVIRONMENTAL ASPECTS AND WASTE DISPOSAL

44592 (NP—22840) **Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals.** Kumamoto, S.; Uemura, H. (Corporate Unverified). 1977. 14p. (In Japanese). TIC.

Report No. 13 of Kagoshima Prefecture resources development conference investigations and research.

Experiments were performed in which SHIRASU zeolite (Na-P type) was used to adsorb heavy metals from geothermal effluent. High purity SHIRASU is an excellent adsorption agent for Pb, Cu, Zn, and Cd. It exhibits its highest adsorptivity in solutions which have a pH greater than five. In effluent with a pH of 6 to 7, 1.0 g of SHIRASU absorbed 1.0 g of Pb. About 0.1 g of Cu, Zn, or Cd were adsorbed by 1.0 g of the zeolite. Whereas most adsorption agents perform best at room temperature, SHIRASU performs excellently at 55°C, making it particularly suitable for application to geothermal waste water. Arsenic, which is present in the effluent from the Kokonoe-Otake and Hatchobara geothermal fields, cannot be adsorbed by the zeolite as it forms an anion in aqueous solutions. This makes it necessary to remove the arsenic by precipitation with iron salts or sodium sulfide.

44593 (UCRL—13832) **Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report.** Mills, W.L. (North Carolina Central Univ., Durham (USA)). 1977. Contract W-7405-ENG-48. 22p. Dep. NTIS, PC A02/MF A01.

The salinity tolerance of Gambusia affinis was determined in static bioassays. Gambusia easily tolerated salinity of 47.5 percent in 96 hour static bioassays. Survival at this level was 93.3 percent with the lowest survival being 68 percent at 40 percent salinity. The acute toxicities of endrin, DDT, aldrin, and dieldrin to Gambusia were determined by static and intermittent-flow bioassays. Toxicity was measured as the Mediant lethal Concentration (TL_{50}) for 96-hr exposures. TL_{50} values were lower in the intermittent-flow bioassays than in static bioassays. Residue concentrations were also compared in surviving and dead fish from the intermittent-flow bioassays. Residue concentrations in fish that died during tests were higher than those of fish that survived. However, the range of concentrations in dead and living fish overlapped.

44594 (UCRL—13849) **Salton Sea sampling program: baseline and toxicity studies.** Tullis, R.E. (California State Univ., Hayward (USA). Dept. of Biological Sciences). 1977. Contract W-7405-ENG-48. 33p. Dep. NTIS, PC A03/MF A01.

Baseline data on several of the Salton Sea fishes are reported. Morphometric (dimensions) and meristic (counting elements) data are presented as a baseline to evaluate any accumulation and physiological stresses that the fishes may experience as a result of geothermal development. Trace elements were analyzed in selected tissues or whole fish. The trace elements evaluated were K, Cu, Fe, Cu, Zn, Br, Rb, Sr, and Pb. The major fishes studied were corvina (Cynoscion xanthulus), gulf coaker (Bairdiella icistius, and molly (Poecilia latapinna). Other fishes occasionally tested were Tilapia sp. and sargo (Anisotremus davidsonii).

GEOTHERMAL POWER PLANTS

REFER ALSO TO CITATION(S) 44597, 44609

DESIGN AND OPERATION

REFER ALSO TO CITATION(S) 44598

GEOTHERMAL ENGINEERING

DRILLING TECHNOLOGY AND WELL HARDWARE

44595 (CONF-770754—1) **Rock drilling and crushing methods: congealing crush of hot dry rock.** Hayami, H.; Kobayashi, H.; Matsunaga, T. (Corporate Unverified). 1977. 4p. (In Japanese). TIC.

From 6. meeting on pollution and resources; Tokyo, Japan (21 Jul 1977).

Studies were made of the fracturing behavior of hot rock under thermal stress. Specimens of Kofu andesite 30 cm^2 having a 6 cm diameter hole bored through them were heated to 330°C at a rate of 2.6°C/h. They were then cooled for two hours by water at a temperature of 11°C and a pressure of 1 kg/cm^2, flowing at 75 l/min. This resulted in fracturing of the specimens, accompanied by a loud report. Although the temperature differential between the bore surface and the outside of the specimen was not measured directly, it was estimated to be about 55°C. The same experiment was repeated with the addition of a simulation of conditions at a depth of 5000 m (1250 kg/cm^2). With uniaxial stress applied, a temperature differential of 440°C was required for fracturing. Under conditions of hydrostatic (spherical vector) stress, a differential of 280°C was sufficient to achieve fracturing.

44596 (SAND—77-1630) **Geothermal well technology: drilling and completions program plan.** Newsom, M.M.; Barnett, J.H.; Baker, L.E.; Varnado, S.G.; Polito, J. (Sandia Labs., Albuquerque, N.Mex. (USA)). Mar 1978. Contract EY-76-C-04-0789. 71p. Dep. NTIS, PC A04/MF A01.

The drilling and completion portion of the long-range Geothermal Well Technology Program is presented. A nine-year program is outlined based upon an objective of reducing the cost of geothermal energy development and providing a major stimulus to meeting the power-on-line goals established by the Department of Energy. Major technological challenges to be addressed in this program include improvements in geothermal drilling fluids, downhole drilling motors, rock bits and the development of high flow rate, high temperature completion and reinjection techniques. In addition, fundamental studies will be conducted in drilling energetics to improve the understanding of drilling mechanics. This will lead to advanced development of high performance, low cost geothermal drilling systems.

CORROSION, SCALING, AND MATERIALS DEVELOPMENT

44597 (BNL—50777) **Economic assessment of polymer concrete usage in geothermal power plants.** (Burns and Roe Industrial Services Corp., Paramus, N.J. (USA)). Nov 1977. Contract EY-76-C-02-0016. 50p. Dep. NTIS, PC A03/MF A01.

Results of a study established to review the Heber and Niland, California 50 MWe conceptual geothermal power plants designs and to identify areas where non-metallic materials, such as polymer concrete, can be technically and economically employed are reported. Emphasis was directed toward determining potential economic advantages and resulting improvements in plant availability. It is estimated that use of polymer concrete in the Heber plant will effect a savings of 6.18 mills per KWH in the cost of power delivered to the network, a savings of 9.7%. A similar savings should be effected in the Niland plant.

SAFETY AND CONTROL

44598 (NP—22300) **Safety measures for geothermal power generation plant without steady monitoring system.** (Japan Geothermal Energy Association, Tokyo). 1975. 45p. (In Japanese). TIC.

Portions of document are illegible.

The Committee of Ground Facilities reported on recent advances in geothermal power generation. Because of the geological location of a particular plant, unmanned operation is necessary. The Committee investigated the safety of operation of the plant without constant monitoring systems. This was done by means of a model system. Information on maintenance and safety facilities of the

Matsukawa and Otake plants are provided as a technical standard for unmonitored systems.

44599 (SAN—1269-1(Vol.2)) **Evaluation of geothermal energy exploration and resource assessment. Final report. Volume II. Two phase flow in the geothermal wellbore.** Ridgway, S.L. (R and D Associates, Marina del Rey, Calif. (USA)). Dec 1977. Contract EY-76-C-03-1269. 24p. (RDA-TR—0400-002). Dep. NTIS, PC A02/MF A01.

Some of the methods available for predicting the pressure drop in a vertical two-phase flow were examined for their usefulness in analyzing the behavior of the two-phase flow in a geothermal wellbore. Previous work in this area has generally been directed toward maximizing the deliverability of the wellbore . In order to get a fresh view point the mechanical efficiency of the two-phase flow in lifting the fluid to the surface was examined. Two well-known methods were applied to geothermal Mesa 6-1, the Hagedorn-Brown holdup correlation, and Wallis' drift flux slug flow model. Predicted mechanical efficiencies were about 30%; the actual measured efficiency is 35%. Both methods gave similar results for the overall pressure drop, but predicted opposing strategies for improving performance. The Hagedorn-Brown correlation suggests that the wellbore diameter be increased in order to reduce pressure drop, while Wallis' drift flux slug flow model suggests the opposite. The need for more data in the geothermal diameter and fluid properties range is quite apparent.

RESERVOIR STIMULATION AND EXTRACTION TECHNOLOGY

REFER ALSO TO CITATION(S) 44595

DIRECT ENERGY UTILIZATION

44600 (SAN—1326-1/1) **Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report.** (Geonomics, Inc., Berkeley, Calif. (USA)). Aug 1976. Contract EG-77-C-03-1326. 256p. Dep. NTIS, PC A12/MF A01.

Discussion is presented under the following section headings: background and some technical characteristics of geothermal resources; geology and geohydrology, geophysics, and, conclusions regarding availability of geothermal energy for nonelectric uses; agricultural assessment of Lake County, site assessment for potential agricultural development, analysis of potential agricultural applications, special application of low cost geothermal energy to algae harvesting, development of an integrated agribusiness, geothermal complex in Lake County, analysis of individual enterprises, and, recommendations for subsequent work; demographic characteristics, economic condition and perspective of Lake County, economic impact of geothermal in Lake County, social and economic factors related to geothermal resource development, socioeconomic impact of nonelectric uses of geothermal energy, and, identification of direct heat applications of geothermal energy for Lake County based on selected interviews; cost estimate procedure, example, justification of procedure, and, typical costs and conclusions; and, recommended prefeasibility and feasibility studies related to construction of facilities for nonelectric applications of geothermal resource utilization. (JGB)

GEOTHERMAL DATA AND THEORY

REFER ALSO TO CITATION(S) 44575

ROCK-WATER-GAS INTERACTIONS

44601 (CONF-7610123—4) **Rock-water solution systems in geothermal fields.** Shikazono, N. (Corporate Unverified). 1976. 1p. (In Japanese). TIC.

From Annual meeting of the Geochemical Society of Japan; Nagoya, Japan (25 Oct 1976).

Portions of document are illegible.

It has been shown that metamorphic mineral assemblages differ according to depth and temperature and that the chemical composition of hydrothermal fluids is related to the assemblages. It is assumed that the mineral assemblages and the geothermal fluids exist at equilibrium. The chemical compositions of various geothermal fields were determined. Based on that information, graphs were drawn showing several relationships between mineral assemblages and solutions. The graphs are plotted as functions of cation concentration, Cl ion concentration and temperature. A graph using coordinates of cation concentration and Cl ion concentration shows that the cation concentration increases with Cl ion concentration and that the increase is directly proportional to the ionic charge. Where cation concentration is plotted against temperature it can be seen that K ion concentration increases with temperature and Mg ion concentration and pH decrease with increasing temperature. At low temperatures Ca ion concentration decreases with rising temperature but at high temperatures it increases.

WIND ENERGY

WIND ENERGY ENGINEERING

APPLICATIONS

REFER ALSO TO CITATION(S) 44419, 44435

TURBINE DESIGN AND OPERATION

44602 (LBL—6889) **Reliability of wind power from dispersed sites: a preliminary assessment.** Kahn, E. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Apr 1978. Contract W-7405-ENG-48. 46p. Dep. NTIS, PC A03/MF A01.

The reliability benefit of geographically dispersed wind turbine generators is analyzed. Electricity produced from wind machines experiences wide fluctuations of output at a given site. Yet the value of electricity is a function of its reliability. Pricing schedules have traditionally valued firm power, that is, reliably available power, much more highly than "dump power;" that is, power which is available intermittently on an "if and when" basis. The conventional wisdom on wind power suggests that it is unrealistic to expect that wind generation will be sufficiently reliable to displace conventional capacity. While such conclusions may be valid for analysis of individual sites, the main thesis of this paper is that geographical dispersal improves aggregate reliability.

44603 **Vertical axis wind turbines.** Musgrove, P.J. (to National Research Development Corp.). US Patent 4,087,202. 2 May 1978. Priority date 21 Jul 1975, United Kingdom of Great Britain and Northern Ireland (UK). 8p.

A vertical axis wind turbine comprises one or more aerofoil section blades attached to a support structure. The blade has at least one part thereof which is acted on by centrifugal forces as the blade rotates with the support structure and thereby caused to increase its angle of inclination to the vertical axis when the speed of rotation increases beyond the normal operating range, whereby the rate of increase of rotational speed with wind speed is reduced.

44604 **Windmill with radial vanes.** Tamanini, R.J. US Patent 4,086,026. 25 Apr 1978. Filed date 4 Feb 1977. 4p.

An elongated cylindrical body is provided for a greater length than its diameter and including a cylindrical side wall. The body is open at its opposite ends and journaled for rotation about an axis generally coinciding with the center axis of the body. The body includes a plurality of circumferentially spaced longitudinally extending slots similarly slightly inclined relative to radial planes of the body passing through the slots. One set of corresponding edge portions of the cylindrical side wall defining corresponding longitudinal edges of the slots include integral outwardly projecting substantially rectangular vanes extending along the slots and the vanes comprise outwardly deflected integral positions of the cylindrical side wall of the body.

SITE CHARACTERISTICS

44605 **Wind shear fluctuations downwind of large surface roughness elements.** Ramsdell, J.V. (Battelle, Pacific Northwest Laboratory, Richland, Wash. 99352). *J. Appl. Meteorol.;* **17**: No. 4, 436-443(Apr 1978).

Wind measurements in the lowest 50 m of the atmosphere approximately 1 mi downwind of an urban area are examined to provide estimates of the short-term fluctuations of the vertical and lateral shear of the longitudinal component of the wind during six periods of slightly to moderately unstable atmospheric conditions. The fluctuations are described by a Pearson Type IV probability distribution. Models are presented for the standard deviation, skewness and kurtosis of the distributions. The distributions are slightly skewed and more peaked than Gaussian but tend toward Gaussian as separation increases. Time scales for the shear fluctuations are described.

ELECTRIC POWER ENGINEERING

REFER ALSO TO CITATION(S) 44394

44606 (AED-Conf—76-399-002) **Impact of the technological change on energy technology.** Schaefer, H. (Technische Univ. Muenchen (Germany, F.R.). Lehrstuhl und Lab. fuer Energiewirtschaft und Kraftwerkstechnik). 1976. 20p. (In German). (CONF-7610101—2). Dep. NTIS (US Sales Only), PC A03/MF A01.

From 59. VDE general meeting; Muenchen, F.R. Germany (11 Oct 1976).

The development of electrical engineering, and its contribution and importance to energy supply are briefly reviewed. Starting with the specific characteristics of electric current as an energy carrier, the close interaction between possibilities for using electric power and innovations in the field of equipment production are explained and illustrated with examples. Further, it is shown how progress in other disciplines influence the technological development of electric power generation, tansmission, distribution, and use.

POWER PLANTS AND POWER GENERATION

REFER ALSO TO CITATION(S) 44834

44607 (FE—1806-23) **Overall Plant Design Description (OPDD), low-Btu CO gas electric power plant.** (General Electric Co., Schenectady, N.Y. (USA). Gas Turbine Div.). Jul 1977. Contract EX-76-C-01-1806. 173p. Dep. NTIS, PC A08/MF A01.

This Overall Power Plant Design description (OPDD) for the integrated, low-Btu fixed-bed Coal Gasification System-Combined Cycle (CGS-CC) plant is intended to establish the functional specifications and control requirements for an advanced water-cooled gas turbine operating at 2600°F and for the other major components and subsystems associated with the baseline combined cycle design. The overall plant incorporates the Fixed-bed-Coal Gasification System—Combined Cycle (FB-CGS—CC) to provide a net power output of 504 MW with a thermal efficiency of 41.42 percent, based on a higher heating value coal pile to bus-bar. The Entrained-Bed—Coal Gasification—Combined Cycle (EB-CGS-CC) was studied as an alternative plant in parallel with FB-CGS-CC. Study results of EB-CGS-CC are reported. Major systems for both FB and EB coal gas plants include the following categories: fuel system, prime cycle, bottoming cycle, balance of plant, integrated plant control, and electrical. Each of these major system categories is described. The FB coal gas plant operates as follows. Low-Btu coal gas is generated from run-of-mine coal in a bank of 14 gasifiers and fed through a low-temperature gas cleanup system which removes sulfur and other undesirable constituents from the gas before it is supplied to the gas turbine combustors. The prime cycle system accepts the low-Btu gas and burns it in two 180 MW gas turbine-generators. Extraction air from the gas turbine compressor provides air blast to the gasifiers. Exhaust gas from the gas turbine passes into a Heat Recovery Steam Generator (HRSG), where steam is produced for the bottoming cycle system which includes the two HRSGs, the single 155 MW steam-turbine generator, the condenser, and all steam cycle associated equipment and subsystems. The balance-of-plant system includes the water supply and preparation equipment, heat rejection equipment, and electrical and mechanical support systems.

44608 (FE—2583-13) **Conceptual design for an atmospheric fluidized-bed direct combustion power generating plant. Phase I. Commercial plant conceptual design. Annual report, January 14, 1977—January 31, 1978.** Norton, R.C. (Stone and Webster Engineering Corp., Boston, Mass. (USA)). 17 Feb 1978. Contract EF-77-C-01-2583. 16p. Dep. NTIS, PC A02/MF A01.

The conceptual design of a commercial size (560 MW), complete power generating station incorporating an atmospheric fluidized bed boiler was developed for two parallel cases presenting the boiler designs of two major boiler manufacturers. These were preceded by the presentation of the basis for comparison, which was also a 560 MW unit, which incorporated a conventional pulverizer coal suspension fired boiler with associated facilities including, particularly, a wet limestone flue gas scrubber. Technical notes were prepared or were in preparation on: 570 MWe base plant definition and general design criteria; AFB state-of-the-art; 570 MWe AFB plant definition; evaluation of merit; and development of a mathematical model of AFB control functions and analysis of load following capability. Eleven electric utility companies were contacted in the course of the year to apprise them of the AFB project and to engage their interest in review of the progress of the project as it developed. Oral and visual presentations were made to engineers of each company and a copy of the Base Plant Reference dated June 1977 was given to them at the presentation or soon thereafter. Later in the year, a second volume titled Comparison Plant Exhibits, Incorporating Manufacturers Unique AFB Boiler Design and Ancillary Systems, dated December 1977, was distributed for comparison to the base.

44609 **Energy conversion system.** Schwartzman, E.H. US Patent 4,084,379. 18 Apr 1978. Filed date 22 Aug 1975. 20p.

An energy conversion system is described for the production of power from hot fluid sources which may contain dissolved solutes and undesirable noncondensable gases. Direct heat transfer is utilized by the hot fluid sources to vaporize a working fluid which is then in turn utilized for the production of power. In the given system the working fluid is employed in such a manner as to blanket the appropriate interior surfaces of the apparatus thus preventing contamination by any of the dissolved solutes which subsequently may have precipitated out during the energy conversion stage of the power. Also disclosed is a modification of the energy conversion system whereby any loss of the working fluid is prevented, thereby eliminating the necessity of their replacement, so that the given system can operate for extended periods of time without the added expense of providing for make-up fluid. Another disclosed feature in the given system is a method by which the noncondensable gases contained in the hot energy source fluid can be separated and then processed where necessary to enable the undesirable elements to be disposed of without injuring the environment.

44610 **Foundations of nuclear engineering.** Connolly, T.J. New York; John Wiley and Sons, Inc. (1978). 354p.

Chapters are included on energy: its forms and transformations, energetics and mechanics of nuclear reactions, energy producing nuclear reactions, interactions of radiation in matter, health effects of nuclear radiation, radioactivity and decay thermal power, fission power reactor system, and fusion reactors.

COOLING AND HEAT TRANSFER EQUIPMENT AND SYSTEMS

REFER ALSO TO CITATION(S) 44622

44611 (COO—4531-1) **Experimental study of bank aerodynamics of atmospheric spray cooling systems.** Wang, W.; Porter, R.W. (Illinois Inst. of Tech., Chicago (USA)). Dec 1977. Contract EC-77-S-02-4531. 88p. Dep. NTIS, PC A05/MF A01.

Atmospheric spray cooling systems are alternatives to cooling ponds and cooling towers for rejecting condenser heat of steam-electric power plants. This study concerns the flow of the atmospheric wind over the confining banks of the system, and concentrates on the effects of bank height and geometry on the profiles of wind velocity and turbulent diffusivity incident to the sprays and the possibility of flow separation which may substantially degrade thermal performance. The literature of flow over similar geometries is reviewed. A wind-tunnel study was performed on a scale reduced 90 : 1 wherein both 1 : 3 and right-angle banks of two bank heights were analyzed. The full-scale equivalent bank heights were 2.3 m (7.5 ft) and 6.8 m (22 ft). Measurements were also taken with sprays modeled with wire mesh of equivalent aerodynamic blockage. The atmospheric boundary layer was approximately simulated through the use of a counter wall jet, screens and artificial aerodynamic surface roughness. The resultant profiles of wind velocity, Reynolds turbulent stress and turbulence kinetic energy are presented and compared. The Reynolds stress and turbulence kinetic energy are indicative of the level of turbulent diffusivity, important in atmospheric dispersion of heat and humidity. Field measurements were also taken of mean wind velocity for three bank geometries at the Quad-Cities Nuclear Station. However, these data were more limited and less controlled than the wind-tunnel results. The 1 : 3 slope bank cases resulted in no apparent flow separation although the velocity and turbulent stress were reduced near the base of the banks, especially for the higher bank case. In the case of the right-angle banks, flow separation occurred extending downwind approximately 1.5 bank heights. It is suggested that the spacing from the base of the bank to the first row of modules be greater than 1.5 bank heights.

44612 **Large wet-type cooling towers and their influence on the environment.** Schiffers, A. *Braunkohle;* **29**: No. 10, 413-418(Oct 1977). (In German).

Large wet-type cooling towers with natural draft are said to be ecologically beneficial today, especially concerning the heat emission from power plants. A description is given of the influence of such cooling towers on the environment and the possible climatic influences are considered in detail. Recent investigations have shown that wet-type cooling towers represent no danger of any kind for fauna and flora as to the bacterial radiation. Physical studies have shown that neither the emitted water vapor nor the heat emitted into the atmosphere, can significantly change the macroclimate and microclimate. At present, wet-type cooling towers cannot be replaced

by dry-type or so-called hybrid-type cooling towers, the technical development of which for large units being not yet guaranteed.

POWER CYCLES

REFER ALSO TO CITATION(S) 44138, 44615, 44616

COMPONENTS

REFER ALSO TO CITATION(S) 45139

44613 (EPRI-AF—665) **Parameter monitoring for corrosion control of utility gas turbines. Interim report.** Boenig, F. (United Technologies Corp., South Windsor, Conn. (USA). Power Systems Div.). Mar 1978. 128p. Dep. NTIS, PC A07/MF A01.

Hot corrosion is a significant durability limiting factor in industrial gas turbine engines. It is caused primarily by alkali sulfates depositing on the turbine airfoils. The object of this program is to determine from field and laboratory test data the conditions that cause deposition of these corrodents and to define an engine control system that will minimize their effect. Field data on 600 engines was statistically analyzed to determine the influence on hot corrosion of fuel type, engine washing, air filtration and the proximity of the engine sites to oceans. Laboratory tests are being conducted on turbine materials, with and without protective coatings, to assess relative resistance to corrosion. Corrosion rates in the presence of sodium sulfate alone and with carbon, vanadium and lead are being defined. The primary source of sodium is airborne sea salt and contaminated fuel. Atmospheric and fuel salt concentrations have been measured at a variety of U.S. sites. Sodium ion concentrations in the air stream inside engines were monitored for evidence of impulsive shedding of accumulated salt. An engine control system which will monitor the atmospheric and fuel-borne salt concentrations and signal the need for an engine water wash cycle to remove accumulated salt before corrosion has started is being defined. The control can also reduce power to slow the corrosion rate if the wash is not performed. The program is approximately 50% complete at this point. Results show that water washing reduces the incidence of corrosion and that turbine materials can tolerate alkali sulfates for a limited period before hot corrosion commences. Remaining work will be directed at determining when the corrodents are released and/or deposited on the turbine. Ideally the control system will recognize the likelihood of this occurrence and signal a wash cycle.

44614 (FE—1237-T-7) **Multicell fluidized-bed boiler design, construction, and test program. Monthly progress report No. 66.** Leon, I.W.; Claypoole, G.; Reed, R.R. (Pope, Evans and Robbins, Inc., New York (USA)). 31 Mar 1978. Contract EX-76-C-01-1237. 41p. Dep. NTIS, PC A03/MF A01.

Design, construction and test program for a 300,000 lbs/hr steam generating capacity multicell fluidized-bed boiler (MFB), as a pollution-free method of burning high-sulfur, or highly corrosive coals, is being carried out. The concept involves burning fuels such as coal, in a fluidized-bed of limestone particles that react with the sulfur compounds formed during combustion to reduce pollution. Nitrogen oxide emissions are also reduced at the lower combustion temperatures. The $CaSO_4$ produced in the furnace is discharged with the ash or regenerated to CaO for reuse in the fluidized-bed. Information is presented on continued evaluation of alternate coal feed needles, testing of static rock layer as protection for the air supply grid, continued coal feed eductor tests, and gas sample traverses at the Alexandria laboratory; installation of test instrumentation and modifications to the MFB at Rivesville; supporting engineering and design efforts at New York office; and subcontract activities.

44615 (FE—1765-42) **High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1—December 30, 1977.** Sims, C.T. (General Electric Co., Schenectady, N.Y. (USA). Gas Turbine Div.). Feb 1978. Contract EX-76-C-01-1765. 47p. Dep. NTIS, PC A03/MF A01.

Results from the completed Initial Coal-Derived Liquid Fuel Tests are presented, and continue to be analyzed, -including evolution of the type of evaluation present in the deposits. The effects of changes in the Na/K ratio are given. The Screening Tests (Small Burner Tests) have been completed. Penetration data for exposed specimens are given, but not yet fully analyzed. Data for ceramic specimens are also included. The low SO_4^{2-} Flux Test was terminated and a preliminary evaluation of the data is given. The Confirmation Test equipment was assembled and checked out, and the Confirmation Test completed. General observations on system operation were made, for complete analysis of the extensive data taken will be given in subsequent reports. Thus, in summary, all testing under this contract was completed in the contract period. However, evaluation of the data from the tests continues apace, and a 3 months no-cost extension was arranged between DOE and GE to allow finalization of all reports, including preparation of the overall Final Report.

44616 (FE—2291-12) **High temperature turbine technology program: Phase I. Topical report. Phase III preliminary turbine subsystem technology readiness verification program plan.** (Curtiss-Wright Corp., Wood-Ridge, N.J. (USA). Power Systems Div.). Feb 1977. Contract EX-76-C-01-2291. 58p. Dep. NTIS, PC A04/MF A01.

The ERDA High Temperature Turbine Technology Program has recognized that the most attractive system for using low Btu, coal-derived fuel gas and coal-derived liquid fuel is the combined cycle power plant, that gasification and liquefaction costs can be offset by increasing the gas-turbine efficiency through operation at higher turbine inlet temperatures. The overall objective of this program is to develop a high temperature turbine subsystem, for an open-cycle industrial gas turbine, which meets the following goals: operation at from 3000°F turbine inlet gas temperatures; utilization of low Btu gasified coal and coal-derived liquid fuels; and suitability for integration into a high efficiency, combined-cycle electric power generating plant. The program will be conducted in 3 phases, over a 5 year time span. The Phase I objective was to define the systems and the development efforts required during the Phase II "Technology Testing and Support Studies" and the Phase III "Verification Test Program" to bring these systems to technology readiness. Conceptual designs of commercial combined/cycle plants utilizing the coal-fueled high temperature turbine system were part of the Phase I effort. Selection of the turbine cooling concept and design definition of the high temperature turbine subsystem were also established. Progress in Phase I is reported.

44617 (PB—274758) **High pressure steam pipe.** Sun, C.T.; Ledger, A.S.; Lo, H. (Purdue Univ., Lafayette, Ind. (USA)). 3 Jun 1976. 33p. NTIS PC A03/MF A01.

A detailed dynamic analysis, presented in a series of reports, was conducted on the seismic response and structural safety of key subsystems (steam generator, high pressure steam piping, coal handling equipment, cooling tower, chimney) of Unit No. 3 of TVA at Paradise, Kentucky in order to: (1) determine for the key components the natural frequencies below 50 Hz and the corresponding normal modes; (2) determine response of plant to seismic disturbances; (3) verify through full scale tests results obtained in (1) and determine estimates of damping needed in (2); (4) determine potential failure modes of major structural components; and (5) determine a spare parts policy for a power system so that outages due to damage from seismic disturbances are minimal. Analytical and experimental methods are used. Included in this volume is a description of how to determine the natural frequencies as well as the seismic response of a piping system in a power plant. These results are intended to provide information on the seismic response problem that is useful for developing future design criteria for these piping systems.

WASTE HEAT UTILIZATION

44618 **Increased output from open-cycle gas turbine plant using water/steam injection.** Franke, U. *Brennst.-Waerme-Kraft;* **29**: No. 12, 471-474(Dec 1977). (In German).

Remarkable additional output reserves can be realized with good efficiency at a gas turbine plant with an attached waste heat boiler provided for peak-load application, by using water/steam injection into the air/flue gas flow between compressors exit and turbine inlet. A thermodynamic investigation deals especially with the dependence of the process efficiency and the achievable output increase on the preheating of the injection medium as well as on the air ratio of combustion.

ECONOMICS

44619 **Energiekosten senken. Ein Leitfaden fuer Ankauf und Betrieb. (Lowering energy costs. A practical guide for purchase and operation).** Deparade, K. (ed.). Graefelfing, Germany, F.R.; Technischer Verl. Resch (1977). 202p. (In German).

In individual chapters, the article shows several ways of reducing the energy costs for industrial plants and suggests corresponding measures. The main point is, above all, the electrical energy supply and its characteristics (power delivery contracts, special price decisions etc.). Maximum surveillance, maximum load optimization and blind current compensation are discussed as measures for energy cost reduction. Other chapters deal with natural gas contracts and the characteristics of natural gas supply, profitable steam and power generation, and with the possibilities to save energy by thermal protection in industrial plants.

44620 **Effects of the construction and operation of a coal-fired power station on production and employment rates.** Wessels, H. *Dtsch. Inst. Wirtschaftsforsch., Wochenber.;* **43**: No. 48, 443-448(Dec 1976). (In German).

It is shown which effects the construction and operation of a 2 x 700 MW coal-fired power plant with charge of 2 Million tons of coal per year has an gross production and employment rates in the

Federal Republic of Germany. The problems of energy supply in general and environmental protection, which are new in public discussion, are not dealt with.

OFF-PEAK ENERGY STORAGE

REFER ALSO TO CITATION(S) 44908, 44909

44621 Conservation of electrical energy. Grise, F.G.J.; Lovell, W. US Patent 4,085,333. 18 Apr 1978. Filed date 17 Feb 1976. 4p.

In an electric generator capable of producing surplus electrical energy at certain periods, an improvement is described which comprises utilizing the surplus electric energy to directly heat an electricity conducting heat storing magma, the magma having passages therethrough for the selective reception of water producing steam during high demand or low energy producing periods to increase the total production of electrical energy.

FUELS

REFER ALSO TO CITATION(S) 44072

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 44090

44622 (CONF-771231—3) **Perspectives on fish impingement.** Sharma, R.K. (Argonne National Lab., Ill. (USA)). 1977. Contract W-31-109-ENG-38. 21p. Dep. NTIS, PC A02/MF A01.

From 4. workshop on entrainment and impingement; Chicago, IL, USA (5 Dec 1977).

Data on fish impingement and related parameters are being gathered at a large number of power stations throughout the country at substantial monetary and manpower costs. A national survey of fish impingement at power plants was conducted and much of the information compiled in a standardized format—an effort that we think will aid in planning improvements in the design, siting, and operation of the cooling-water intakes. This paper examines the objectives of the fish impingement studies, monitoring programs, variables affecting fish impingement, siting and design criteria, state-of-the-art of screening systems, and suggestions for meeting 316(b) requirements. It also discusses where the emphasis should be placed in future fish-impingement related activities.

44623 Apparatus for measuring a flux of neutrons. Stringer, J.L. (to Energy Research and Development Administration). US Patent 4,002,916. 11 Jan 1977. Filed date 26 Jun 1975. 6p.

PAT-APPL-590,758.

A flux of neutrons is measured by disposing a detector in the flux and applying electronic correlation techniques to discriminate between the electrical signals generated by the neutron detector and the unwanted interfering electrical signals generated by the incidence of a neutron flux upon the cables connecting the detector to te electronic measuring equipment at a remote location.

NOXIOUS GAS AND PARTICULATE ABATEMENT AND CONTROL

REFER ALSO TO CITATION(S) 45235

44624 (PB—274395) **Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report.** Dradesky, E.L.; Leavitt, A.W.; Shapiro, E. (Indiana Univ., Bloomington (USA). School of Law). Dec 1976. Contract ARC-TQ-52/PA/CO-5236. 154p. NTIS PC A08/MF A01.

The report describes a field demonstration test, and test results of the SULF-X advanced flue gas desulfurization (FGD) process, a means of controlling sulfur and nitrogen oxide emissions from combusting high sulfur fossil fuels. For demonstration purposes, an expendable 1 MWe gas-solid liquid contractor was installed, test instrumented, and operated on one of four boilers of the steam plant located at Fort Benjamin Harrison just outside Indianapolis, Indiana. After an extensive series of test runs aimed at thorough calibration and checkout of the demonstration system under varying operational conditions, one continuous 52hr hour and numerous short (3 to 5 hr) tests were completed. The sulfur oxides react with an alkaline slurry of iron sulfide which is regenerated in another circuit. Specific details of the tests and test results are presented.

44625 (PB—274544) **EPA alkali scrubbing test facility: advanced program. Progress report No. 3, February—November 1976.** Head, H.N. (Bechtel Corp., San Francisco, Calif. (USA)). Sep 1977. Contract EPA-68-02-1814. 708p. NTIS PC A99/MF A01.

The report gives results of advanced testing from February through November 1976 of 30,000 acfm (10 MW equivalent) lime/limestone wet scrubbers for SO_2 and particulate removal at TVA's Shawnee Power Station. Short-term factorial tests (6 to 8 hr each) with lime, limestone, and limestone/MgO were conducted on both systems to determine SO_2 removal as a function of operating parameters. Longer tests (averaging 190 hr each) were conducted on the venturi/spray tower with lime and lime/MgO, both with and without fly ash in the flue gas. On the TCA, longer tests (averaging 180 hr each) were conducted with limestone/MgO, lime, and lime/MgO on flue gas containing fly ash. Adding MgO improved SO_2 removal but, in some cases, created a scaling problem. On the venturi/spray tower, particulate mass loading, size distribution, and sulfuric acid mist were measured as a function of operating conditions. Mathematical models fitted to the Shawnee data are presented for predicting SO_2 removal as a function of operating parameters. A simplified procedure is presented for calculating gypsum saturation from analytical data.

44626 Waste flue gas desulfurizing method. Otani, K.; Sawa, T.; Kuroda, O.; Nakajima, F.; Iijima, T. (to Hitachi, Ltd.). US Patent 4,085,194. 18 Apr 1978. Priority date 8 May 1972, Japan. 10p.

A waste flue gas desulfurizing method is described in which a waste flue gas containing sulfurous acid gas is contacted directly with sea-water, whereby the sulfurous acid gas is absorbed in the sea-water and concurrently sulfites are formed in the sea-water by the reaction between the sulfurous acid ions and metal ions present in the sea-water, and then the carbonic acid component contained in the sea-water which is then in the acidic region is released therefrom by a decarbonation operation to restore the pH value of the sea-water in the neutral region, and thereafter oxygen contained in air or from other source is introduced into the sulfite-containing sea-water to convert the sulfites into sulfates.

POWER TRANSMISSION AND DISTRIBUTION

44627 (AD-A—048278) **Structural feasibility of parallel-laminated veneer crossarms. Forest Service research paper.** Youngquist, J.; Brey, F.; Jung, J. (Forest Products Lab., Madison, Wis. (USA)). 1977. 16p. (FSRP-FPL—303). NTIS PC A02/MF A01.

Experimentally and commercially produced laminated M-19 crossarms were tested by standard Rural Electrification Administration (REA) crossarm tests. The laminated crossarms, produced by laminating veneer and by laminating solid-sawn dimension stock, generally performed satisfactorily according to REA specified standards. Materials tested are described and results on standarized tests are summarized. The objective of this work was to provide indications of performance trends. Statistically valid performance comparisons between the materials tested were not possible because of the limited number of samples tested. (Author)

44628 (EPRI-EL—726) **Frequency domain analysis of low-frequency oscillations in large electric power systems. Interim report. Applications of a small-scale computer program.** Byerly, R.T.; Sherman, D.E.; Bennon, R.J. (Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Advanced Systems Technology Div.). Apr 1978. 185p. Dep. NTIS, PC A09/MF A01.

When major electric power systems are interconnected through ties of relatively small capacity, low frequency intersystem oscillations are likely to be troublesome for some operating conditions. Spontaneous intersytem oscillations which have occurred in the western and some midwestern states attest to this aspect of system behavior. The long distances which separate concentrations of generating capacity in those systems also separate many individual generating plants from other machines, so that localized poorly damped higher frequency modes of oscillation also exist. The potential for unstable oscillations must be considered in planning the bulk generation and transmission system, in designing control systems for turbine-generators and dc line terminals, and in system operations. Present practice depends almost entirely on time domain simulation for large system analysis, with computing costs that are relatively high and information in a form which is often not well suited to study purposes. The objective of this research is to develop an alternative to time domain simulation for damping studies. This alternative involves the use of a linearized system model and the calculation of only those system natural frequencies of oscillation and damping factors that are most intimately related to generator rotor motions.

44629 (EPRI-EL—776) **Light-fired thyristor development. Interim report.** Page, D.J.; Lowry, L.L.; Rai-Choudhury, P. (Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Research and Development Center). Apr 1978. 164p. Dep. NTIS, PC A08/MF A01.

A high power light-triggered thyristor has been developed and demonstrated. A series-connected string of eight such thyristors was tested to show feasibility for commercial utility applications in

VAR generator applications. The chief benefit to be derived from light-triggered thyristors is that a high voltage stack of such thyristors can be switched directly by a light signal transmitted through electrically insulating fiber optics cables. Such a system eliminates the need for costly isolation of the gate circuitry and provides immunity to noise-induced false triggering signals. Design considerations applicable to light-triggered thyristors are described and means of optimizing the light source-fiber optic cable system are discussed. A hermetically sealed package for light-triggered thyristors is described. Test results on individual light-triggered thyristors are presented, and the operation of a module consisting of light source, fiber optics cables, and a series string of eight light-triggered thyristors is described. It is concluded that the technology developed in this program is suitable for application in high voltage VAR generator applications. Further technology improvement can result in reduced cost and improved reliability and recommendations for further development effort are made.

AC SYSTEMS, EHV AND UHV

44630 (AED-Conf—76-407-006) **380 kV cable in Berlin.** Gaertner, R. (Technische Univ. Berlin (Germany, F.R.). Inst. fuer Hochspannungstechnik und Starkstromanlagen). 1976. 16p. (In German). (CONF-7609113—3). Dep. NTIS (US Sales Only), PC A02/MF A01.

From Congress on rational energy utilities in urban systems with specialized exhibition at the German Industrial Exhibition; Berlin, F.R. Germany (18 Sep 1976).

Portions of document are illegible.

A new underground cable system for 380 kV is introduced for the electric energy supply in West Berlin since the present power system of 110 kV has reached the upper limit of its efficiency. The special circumstances in West Berlin which must be taken into consideration when introducing the 380 kV-cable are discussed.

44631 (EPRI-EL—690) **Prototype field calibration system for coupling capacitor voltage transformers (CCVTs). Final report.** Hillhouse, D.L.; Petersons, O.; Sze, W.C. (National Bureau of Standards, Washington, D.C. (USA). Electricity Div.). Apr 1978. 204p. Dep. NTIS, PC A10/MF A01.

In recent years, the coupling capacitor voltage transformer (CCVT) has come into wide use for 0.3% accuracy extra-high voltage (EHV) revenue metering in interties between utilities, a function performed for many years by the inductive potential transformer (PT). Whereas the PT has been thoroughly proven in this application, the CCVT has not. Considerable user experience has raised very reasonable doubts as to its adequacy and suggested the need for periodic calibration. Since the CCVT is permanently installed in the substation, this calibration must be done on-site. A prototype field calibration system for CCVTs has been developed. The system consists of (1) CCVT capacitor modules; (2) a high voltage (100 kV) capacitor standard; (3) a current comparator bridge; and, (4) a resonant power supply, all of which are transported in a closed truck. At the substation site, the capacitor modules are removed from the truck and stacked up to form a capacitive divider with a rating that matches the system voltage for calibrating purposes. This divider is used as a transfer standard since it is first calibrated against the high accuracy, high voltage capacitor standard (2) located in the truck. Then it is connected to the high voltage bus to calibrate the substation CCVTs. The mobile unit is compact and comparatively easy to use. Only a two-man crew plus a minimum of support from the local utility are required to assemble and operate the modular system at the test site. System accuracy is 0.05% and 0.3 milliradians. It has successfully undergone two complete field tests in which a total of six CCVTs and six PTs were calibrated. Feasibility of a considerably simpler and less costly system has been demonstrated in a project extension.

44632 (EPRI-EL—720) **Surge behavior of UD cable systems. Final report.** Owen, R.E. (McGraw-Edison Co., Canonsburg, Pa. (USA). Power Systems Div.). Apr 1978. 108p. Dep. NTIS, PC A06/MF A01.

The behavior of surges that enter an underground distribution system was investigated. The industry has accepted, for the most part, that the margin of protection provided by a typical distribution arrester installed at the overhead-underground junction of a 15-kV underground system will be adequate to protect the distribution equipment with a high level of confidence. However, this margin of protection is erroded as the distribution voltage is increased to 25 and 35 kV. The surge attenuation for a spectrum of underground distribution cables is described. The surge characteristics for a number of protective schemes are demonstrated. Key variables that constrain the protection engineer when he studies the merits of various protective schemes are identified. Laboratory evaluations and digital computer simulations were used as investigative tools. Two principle conclusions can be drawn from the results of this project: surges are not attenuated by underground distribution cables shorter than three thousand feet to sufficiently influence the margin for insulation coordination; and multiple arresters will be necessary to achieve acceptable margins of protection for 25-kV and 35-kV underground cables. The various models and techniques needed by the distribution engineer to design the appropriate surge protection system are provided.

44633 (EPRI-EL—738) **Far-infrared inspection of cable insulation. Interim report.** Cheo, P.K. (United Technologies Research Center, East Hartford, Conn. (USA)). Apr 1978. 91p. Dep. NTIS, PC A05/MF A01.

The results of an effort to study the feasibility of real-time, in-process detection of voids and contaminants in polyethylene insulation of power cables are delineated. The detection technique involves the application of far-infrared laser scattering from defects imbedded in the insulation. The effort included the demonstration of noncontacting, nondestructive, real-time detection of voids and contaminants in: (1) thin slabs of polyethylene and cross-linked polyethylene materials, (2) a stationary 25 kV power cable, and (3) the same cable in motion. A far-infrared laser transceiver system was constructed and used for these demonstrations. This system also was used to compile useful information leading toward the requirements for design of a breadboard system. A numerical procedure was developed to compute the Mie-scattering radiation patterns from spherical voids in polyethylene, and to trace the rays through power cable insulation. An index-matching technique was developed and employed successfully to permit the detection of scattered laser radiation from power cable insulation. Results indicate that the smallest defect that can be detected by far-infrared laser scattering technique is about 50 μm (2 mils). This limitation is set by the scattering background from polyethylene material due to its relatively high concentration of microvoids.

SUPERCONDUCTING AND CRYOGENIC SYSTEMS

44634 **Superconducting transmission: more power at half the cost.** Freeman, M. *Fusion;* **1**: No. 8, 46-48(Jun 1978).

The technical and economic feasibility of superconducting power transmission lines are briefly reviewed. It is concluded that U.S. government funding for superconducting transmission line development should receive top priority. (LCL)

NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 44394

44635 (COO—4121-2) **Planning, design, and construction of nuclear power plants: an overview. Final report.** Rhodes, D.A.; Rad, P.F. (Clemson Univ., S.C. (USA). Dept. of Civil Engineering). Dec 1977. Contract EY-76-S-01-4121. 398p. Dep. NTIS, PC A17/MF A01.

Chapters are included on generation system descriptions and alternative energy sources; load forecasting and growth projections; utility studies, program development, and analytical models; organizational alternatives and contract arrangements; project control in the design and construction phase; site management activities; construction activities; and startup and testing.

44636 **Nuclear power. Volume 1. Nuclear power plant design.** Pedersen, E.S. Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1978). 572p.

NUCLEAR POWER PLANT DESIGN is intended to be used as a working reference book for management, engineers and designers, and as a graduate-level text for engineering students. The book is designed to combine theory with practical nuclear power engineering and design experience, and to give the reader an up-to-date view of the status of nuclear power and a basic understanding of how nuclear power plants function. Volume 1 contains the following chapters; (1) nuclear reactor theory; (2) nuclear reactor design; (3) types of nuclear power plants; (4) licensing requirements; (5) shielding and personnel exposure; (6) containment and structural design; (7) main steam and turbine cycles; (8) plant electrical system; (9) plant instrumentation and control systems; (10) radioactive waste disposal (waste management) and (11) conclusion. (DG)

44637 **Nuclear power. Volume 2. Nuclear power project management.** Pedersen, E.S. Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1978). 409p.

NUCLEAR POWER PLANT DESIGN is intended to be used as a working reference book for management, engineers and designers, and as a graduate-level text for engineering students. The book is designed to combine theory with practical nuclear power engineering and design experience, and to give the reader an up-to-date view of the status of nuclear power and a basic understanding

of how nuclear power plants function. Volume 2 contains the following chapters: (1) review of nuclear power plants; (2) licensing procedures; (3) safety analysis; (4) project professional services; (5) quality assurance and project organization; (6) construction, scheduling, and operation; (7) nuclear fuel handling and fuel management; (8) plant cost management; and (9) conclusion. (DG)

POWER REACTORS, NON-BREEDING, LIGHT-WATER MODERATED, BOILING WATER COOLED

REFER ALSO TO CITATION(S) 44810, 44815, 44816, 44818

44638 EPRI programs in power reactor radiation control. Shaw, R.A.; Uhl, D.L. (Electric Power Research Inst., Palo Alto, CA). pp 392-400 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

EPRI is presently supporting research on radiation control techniques for light water nuclear power plants. Nine different contractors working on twelve different contracts are addressing radiation control through techniques such as corrosion control, high temperature filtration, plant operational control, and decontamination. Initial studies have shown that plant piping radiation fields, resulting primarily from the decay of Co-58 and Co-60, are increasing at 25 to 150 mR/h per full power year.

44639 (COO—4066-5) **Fuel performance improvement program. Quarterly progress report, October—December 1977.** Crouthamel, C.E. (Exxon Nuclear Co., Inc., Richland, Wash. (USA)). Jan 1978. Contract EY-76-C-06-1830. 77p. Dep. NTIS, PC A05/MF A01.

The Fuel Performance Improvement Program has as its objective the identification and demonstration of fuel concepts with improved power ramp performance. Improved fuels are being sought to allow reduction or elimination of fuel related operating guidelines on nuclear power plants such that the fuel may be power maneuvered within the rates allowed by the system technical specifications. The program contains a combination of out-of-reactor studies, in-reactor experiments and in-reactor demonstrations. Fuel concepts initially being considered include annular pellets, cladding internally coated with graphite and packed-particle fuels. The performance capability of each concept will be compared to a reference fuel of contemporary pellet design by irradiations in the Halden Boiling Water Reactor. Fuel design and process development is being completed and fuel rod fabrication will begin for the Halden test rods and for the first series of in-reactor experiments. The in-reactor demonstrations are being performed in the Big Rock Point reactor to show that the concepts pose no undue risk to commercial operation. Additional concepts may be considered as the result of a state-of-the-technology review of fuel-cladding interaction and assessment of fuel concepts and the out-of-reactor studies. The results of the program will be used to establish the technical bases for design of fuels with improved power ramp performance.

44640 (EUR—5649) **Ten-yearly report on operations at the Garigliano nuclear power station. Progress report 1 May 1964-31 December 1973.** (Ente Nazionale per l'Energia Elettrica, Rome (Italy)). Jan 1977. 24p. (In Italian). Dep. NTIS (US Sales Only), PC A02/MF A01.

This document is the final report on operation of the Garigliano Nuclear Power Station as required under the participation contract between Enel and Euratom and refers to the first ten years of commercial operation (1 May 1964-31 December 1973) of the power station. In the decade in question the Garigliano Power Station has assumed an important position in the world spectrum of nuclear energy since it was the first thermal-power reactor in the world to have irradiated considerable quantities of plutonium as a fuel in its own core for the production of energy. An experimental programme on this was started in 1966 with theoretical study of plutonium recycling and was followed by the charging of the Garigliano reactor with some mixed oxide elements (PuO_2-UO_2) in 1968 and 1970. The excellent performance of these prototype elements, which among other things were examined in detail at the end of each radiation cycle, prompted Enel to decide in favour of the use of entire batches of recycled fuel elements of the PuO_2-UO_2 type in the reactor from 1975 onwards.

44641 (EUR—5651) **Gundremmingen (KRB) nuclear power plant. Annual report 1975.** (Kernkraftwerk RWE-Bayernwerk G.m.b.H., Gundremmingen/Guenzburg (Germany, F.R.)). Mar 1977. 80p. (In German). Dep. NTIS (US Sales Only), PC A05/MF A01.

The operational year 1975 was marked by continuous full power operations almost without any disturbances; it was interrupted only by a period of five weeks for changing the fuel elements for a revision in May/June. The availability in time was more than 88%. The production of electric energy amounted to 1.900GWh. The short periods of load restrictions shown by the operation diagram during the operational year were caused by the change of control rod sequence and regular tests of the turbine control and other important instruments. The four periods of stand-still not foreseen as mentioned were caused by the following reasons: by a short circuit in the control tension of the primary pumps the mechanically loaded non-return valve of the primary feed water pumps closed. The interruption of the feed water supply caused a scram by 'bad vacuum'. A very serious accident, which was the cause of the death of two workers, happened during the reactor shut up in May. A water-steam mixture escaped from the primary coolant circuit but the aerosol activity inside the building stayed under the admitted limits and no increase of activity release was measured in the stack. On account of the leakage in the turbine region the plant had to be shut down for one day shortly after restarting operation. About three weeks after the accident the plant was shut down for three days in order to dismount and to investigate in detail the accident valve W6 for the finding of possible circumstances causing the accident. No indication of a possible damage was found objecting to a re-use and re-operation of the valve.

44642 (IAEA—18; CONF-751268—, pp 311-372) **Reevaluation of feedwater nozzle cladding defects, Millstone Unit 1.** 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

The fracture mechanics results used for evaluation of the feedwater nozzle inner corner defects identified during the 1974 Feedwater Sparger replacements, and again found during the Fall 1975 inspection, have been revised based upon additional information. The results are summarized by Figures 2 and 3 of this report. Revision 1 corrects an error in Appendix B which results in revisions to Figures 2 and 3. Revised pages contain a vertical line in the right hand margin adjacent to the revision.

44643 (IAEA—18; CONF-751268—, pp 33-80) **Evaluation of the HSST program intermediate pressure vessel tests in terms of light-water-reactor pressure vessel safety.** Merkle, J.G.; Whitman, G.D.; Bryan, R.H. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

A primary objective of the intermediate pressure tests is to develop or verify methods of fracture prediction through the testing of selected structures and materials so that a valid basis can be established for evaluating the serviceability and safety of light-water reactor pressure vessels. The results of the tests already conducted and some of the implications of the results with respect to the safety against fracture of reactor pressure vessels are presented.

44644 Spacer capture rod to spacer grid attachment device. Flora, B.S.; Patterson, J.F. (to Exxon Nuclear Co. Inc.). US Patent 4,081,324. 28 Mar 1978. Filed date 17 Jun 1976. 4p.

A system for capturing a grid spacer in a nuclear fuel bundle which comprises a split sleeve fixed to a capture rod is described. The sleeve is used in conjunction with a grid spacer having openings formed by intersecting walls which include protrusions and coacting springs extending from the walls. The sleeve includes pairs of longitudinally spaced bosses and a standoff boss extending radially outward from the surface of the rod. The pairs of bosses are positioned astride the protrusions from the walls to prevent longitudinal movement of the grid spacer. The split serves as a guide slot to orient the capture rod so that it may pass through the grid spacer openings unencumbered by the protrusions from the grid space walls. The standoff boss is in surface contact with a wall of the grid spacer.

44645 (PB—274370) **Phipps Bend Nuclear Energy Project. Community impact assessment. Final report.** Snapp, P.C.; Teilhet, A.; Newsom, R.; Bond, M.; Garland, M. (Tennessee State Planning Office, Knoxville (USA). East Tenn. Section). 1977. Contract ARC-TQ-26/TN-5103-76-I-302-0401. 58p. NTIS PC A04/MF A01.

In late 1977, the Tennessee Valley Authority (TVA) proposed to build a 2 unit nuclear plant at Phipps Bend on the Holston River east of Surgoinsville, Tennessee. Total estimated cost is 1.6 billion dollars, with a generating capacity of 2,600,000 kilowatts. The facility will have an impact on Hawkins, Greene and Sullivan counties with 2,500 construction employees, a permanent work force of 300, increased availability of energy to stimulate new capital investment and the local government will need to deal with these. This report analyzed the facilities of each community in the impact-

ed area and recommended certain action for infrastructure acquisition or improvements.

44646 Device for thermal insulation of a prestressed concrete vessel which affords resistance to the pressure of a vaporizable fluid contained in said vessel. Aubert, G.; Petit, G. (to Commissariat a l'Energie Atomique). US Patent 4,081,322. 28 Mar 1978. Priority date 19 Jun 1975, France. 10p.

Two cylindrical shells having different diameters and covered with a metallic heat-insulation are disposed respectively within the lower and upper portions of a pressure vessel, the upper shell being closed by a lid. A chamber filled with fluid in liquid phase up to the liquid-vapor interface and with gas above said level is formed by the shells between the vaporizable fluid and the internal vessel wall, a cold liquid seal being formed by the overlapping portion of the shells. Radial expansion of the shells is permitted by supporting means at the level of at least three through-passages and is absorbed by leak-tight means placed opposite to the through-passages.

POWER REACTORS, NON-BREEDING, LIGHT-WATER MODERATED, NON-BOILING WATER COOLED

REFER ALSO TO CITATION(S) 44638, 44639, 44644, 44802, 44808, 44810, 44819, 44820

44647 (EPRI-NP—692) **Effects of hydrogen peroxide additions on shutdown chemistry transients at pressurized water reactors. Final report.** Sawochka, S.G.; Wall, P.S.; Leibovitz, J.; Pearl, W.L. (Nuclear Water and Waste Technology, San Jose, Calif. (USA)). Apr 1978. 249p. Dep. NTIS, PC A11/MF A01.

Hydrogen peroxide injection has been employed on initial cooldown prior to a refueling outage at numerous pressurized water reactors. The injection increases primary coolant Co-58 levels during a period when purification can be used to remove the released activity without impacting on the refueling schedule. To quantify the effects of the peroxide injection, test programs were performed at Turkey Point 3 where peroxide was employed and Kewaunee where no addition was made. Results of these programs and of a limited survey of other utility experience are discussed herein. In summary, hydrogen peroxide injection results in an accelerated release of activated corrosion products which would occur normally when the primary system is vented to the atmosphere. The technique can be of significant value in eliminating the occurrence of significant releases when purification to reduce refueling platform manpower exposures would impact on the refueling outage schedule.

44648 (EUR—5605) **Post irradiation examination of the fuel discharged from the Trino Vercellese reactor after the 2nd irradiation cycle.** Barbero, P.; Bidoglio, G.; Bresesti, M. (Commission of the European Communities, Ispra (Italy) Joint Research Centre; Commission of the European Communities, Karlsruhe (Germany, F.R.). European Inst. for Transuranium Elements; Ente Nazionale per l'Energia Elettrica, Rome (Italy)). Mar 1977. 90p. Dep. NTIS (US Sales Only), PC A05/MF A01.

The post-irradiation analysis of the fuel discharged from the Trino Vercellese reactor after the 2nd irradiation cycle was carried out in the Ispra and Karlsruhe Establishments of the Joint Research Centre. The main objective of the post-irradiation examination programme was the measurement of the burn-up and isotopic composition of selected fuel samples in order to obtain a set of data to be used for checking the accuracy of nuclear code calculations. The other objective of the programme was the metallographic analysis of the UO_2 fuel and the stainless steel cladding. The fuel assembly selected for the analysis (No 509-069) was dismantled at Ispra, in the pool of the ESSOR reactor. The removed fuel rods were subjected to the following examinations: optical inspection, metrology, mechanical tests on the fuel cladding and metallography. Gamma scanning measurements on the fuel rods and gamma spectrometry measurements on selected rod positions were also carried out. Fuel samples to be subjected to radiochemical analyses were cut from the rods at selected positions. The fuel samples were dissolved and aliquots of the solutions were subjected to radiochemical processes and to gamma, mass and alpha-spectrometry determinations. Gamma spectrometry was used mainly to determine the 137Cs activity, from which the burn-up was derived. Mass-spectrometry, combined in some cases with isotope dilution techniques, was used to determine the concentrations and/or isotopic compositions of the heavy isotopes uranium, plutonium, americium of 148Nd and of the krypton and xenon fission gases. Alpha-spectrometry was used to determine the concentrations of some nuclides of plutonium, americium and curium. The concentrations of the heavy isotopes and 148Nd were then used for separate evaluation of the burn-up.

44649 (IAEA—18; CONF-751268—, pp 273-310) **Evaluation of sample problem, case 1 - embedded flaw located in the Beltline Region wall of a PWR reactor vessel.** Palme, H.S. (Babcock and Wilcox Co., Lynchburg, Va. (USA). Nuclear Power Generation Div.). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

The sample problem presented in Case 1 of the ASME Section XI Evaluation Task Group is an embedded flaw located in the beltline region wall of a PWR reactor vessel. The postulated indication is assumed to have been detected at the end of the 23rd effective full power year. When detected, the indication is one inch wide and three inches long, and its center is at a distance equal to 20% of the wall thickness measured from the wall's inner surface. The cumulative fatigue crack growth study indicates that at the end of 32nd effective full power year (end-of-service), the flaw would be 1.0043 inches wide and 3.013 inches long. The end-of-service flaw is found to exceed the ASME Section XI acceptance limit for normal operating conditions when the reactor vessel is cooled at 100F/Hr. During the thermal shock accident conditions, the end-of-service flaw is found to be a non-initiation flaw and meets the acceptance limit for emergency and faulted conditions of ASME Section XI.

44650 (WCAP—8967) **Failure Modes and Effects Analysis (FMEA) of the Residual Heat Removal System.** Eggleston, F.T. (Westinghouse Electric Corp., Pittsburgh, Pa. (USA)). 1976. 30p. Westinghouse Electric Corp., Pittsburgh, PA.

The Residual Heat Removal System (RHRS) transfer heat from the Reactor Coolant System (RCS) to the reactor plant Component Cooling System (CCS) to reduce the temperature of the RCS at a controlled rate during the second part of normal plant cooldown and maintains the desired temperature until the plant is restarted. By the use of an analytic tool, the Failure Modes and Effects Analysis, it is shown that the RHRS, because of its redundant two train design, is able to accommodate any credible component single failure with the only effect being an extension in the required cooldown time, thus demonstrating the reliability of the RHRS to perform its intended function.

44651 (WCAP—9264) **N-16 Transit Time Flow Measurement System (TTFM) description and performance.** Graham, K.F.; Forker, J.M. (Westinghouse Nuclear Energy Systems, Pittsburgh, Pa. (USA)). Feb 1978. 82p. Westinghouse Electric Corp., Pittsburgh.

A Transit Time Flow Measurement System (TTFM) has been developed to accurately measure PWR primary coolant loop flow rate. This method uses the signature of N-16 activity fluctuations to determine the mean coolant transit time between two gamma-ray detectors spaced along the pipe. Cross correlation is used to measure the transit time. When the distance between detectors, the measured transit time and the piping internal diameter are known, the volumetric flow rate in the hot leg of each coolant loop can be determined. The volumetric flow rate can be converted to mass flow rate if temperature (density) is also measured. The TTFM method requires no penetration into the primary system; it requires no flow calibration; and it introduces no pressure drop. The system can be installed on existing nuclear plants and on plants under construction as it requires no primary system design changes. Plant measurements using the TTFM technique at Prairie Island Unit 2 (NRP) have proven the feasibility of the system and show excellent reproducibility, as well as excellent agreement with the results obtained independently using the leading edge flow meter.

44652 System for the emergency injection of liquid into a nuclear reactor core. Verdeau, J.J. (to Commissariat a l'Energie Atomique). US Patent 4,078,966. 14 Mar 1978. Priority date 12 Mar 1974, France. 6p.

The pressure vessel of a reactor such as a PWR is provided with nozzles for the emergency injection of coolant into at least one water-box placed above the reactor core and rigidly fixed to the pressure vessel. Sprinkler-tubes placed within the fuel assemblies in parallel relation to the fuel pins are each connected to the water-box by means of a rectilinear tube.

44653 Holddown device for nuclear fuel assembly. Anthony, A.J. (to Combustion Engineering, Inc.). US Patent 4,078,967. 14 Mar 1978. Filed date 26 Jul 1976. 6p.

An apparatus for preventing "floating" of nuclear-reactor fuel assemblies due to hydraulic forces is disclosed. The apparatus uses a holddown column made of the same material as the core barrel. The column is positioned in a center guide-tube location in the fuel assembly in such a manner as to enable it either to slide within the center guide tube or, if the center guide tube is replaced by the column, to slide through openings in the spacer grids. The lower end of the holddown column engages the lower end fitting of the fuel assembly, and the upper end of the column engages a flow plate to which holddown force is applied. As a consequence of this arrangement, holddown force is transmitted from the flow plate through the

holddown column to the lower end fitting. Movement of the fuel assembly is thereby prevented without a compression load being applied to the fuel-assembly structure. In addition, variations due to thermal expansion in the distance between the lower core plate and the upper core plate are largely made up for by corresponding variations in the holddown column because the holddown column and the core barrel can be made of the same material.

44654 Prediction of primary circuit contamination in power reactors. Beslu, P. (CEA/CEN de Saclay, France); Costa, L.; Frejaville, G.; Pepin, P. pp 374-391 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Knowledge of the amount and distribution of activity in the coolant circuit of a power reactor is of great practical importance for determining shielding and for predicting operating personnel radiation exposure. The present status of mathematicals models to predict the contamination level in power reactor coolant circuits (High temperature, Fast Breeder and Pressurized Water Reactors) are presented in this paper. Some applications are also given.

44655 Analysis of dose rates near the circuit of a PWR after shutdown. Beslu, P.; Devillers, C.; Frejaville, G.; Lalet, A. pp 409-415 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

From activities measured and calculated in the primary circuit of the CHOOZ reactor, gamma dose rates corresponding to individual corrosion product isotope deposits have been determined. These dose rates are compared with experimental results. Contributions of gamma sources deposited in different regions of the steam generators to the dose inside the "channel head" have been evaluated.

POWER REACTORS, NON-BREEDING, GRAPHITE MODERATED

REFER ALSO TO CITATION(S) 44261, 44654, 44805, 44806, 44809, 44822, 44827, 45091

44656 (GA-A—14768) **Tensile tests of 2500-kip prestressing tendons for the PCRV.** Nicolayeff, V. (General Atomic Co., San Diego, Calif. (USA)). May 1978. Contract EY-76-C-03-0167-065. 30p. Dep. NTIS, PC A03/MF A01.

A 2500-kip (11-MN) capacity prestressing tendon consisting of sixty 0.5-in. (12.7-mm) strands was designed and tested for General Atomic Company by VSL Corporation of Los Gatos, California. Results of the static tensile test described in this report, and of dynamic tensile tests conducted by VSL in 1968 and 1969, indicate that the tendon system satisfies the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Division 2, and so can be used for prestressing concrete reactor vessels.

44657 (GA-A—14863) **HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978.** (General Atomic Co., San Diego, Calif. (USA)). Mar 1978. Contract EY-76-C-03-0167-065. 327p. Dep. NTIS, PC A15/MF A01.

The work documented here includes the design, analysis, and testing of the reactor core and its components comprising the fuel elements, hexagonal reflector elements, plenum elements, neutron sources, control rods, and reserve shutdown material. Also included are studies of reactions between core materials and coolant impurities, basic fission product transport mechanisms, core graphite development and testing, the development and testing of recyclable fuel systems, and physics and fuel management studies. Materials studies include irradiation capsule tests of both fuel and graphite. Experimental procedures and results are discussed and, where appropriate, the data are presented in tables, graphs, and photographs.

44658 (GA-A—14900) **HTGR steam cycle configuration evaluation report.** (General Atomic Co., San Diego, Calif. (USA)). 14 Apr 1978. Contract EY-76-C-03-0167. 399p. Dep. NTIS, MF A01.

Portions of document are illegible.

The evaluation of alternate steam cycles for the steam cycle HTGR with the ultimate selection of steam reheat, electric-driven circulator has been completed and is documented. The results of the evaluation can be summarized as follows: (a) the result of the tangible comparison shows insignificant differences between configurations, (b) the results of the intangible comparison are in favor of the non-gas reheat electric-driven circulator Configuration A. Configuration A has been recommended as the steam cycle configuration to pursue. The evaluation was different from previous evaluations in that increased emphasis was placed on the factors of (a) safety and licensing, (b) availability, (c) operability, (d) risk, (e) design development, and (f) schedule, relative to capital and fuel costs which were also included in the evaluation. The evaluation was accomplished by developing and documenting three conceptual designs. These designs, and where necessary, perturbations of the designs, were evaluated both for tangible and intangible assessments. The three base case designs have the following major features: Configuration A—Steam reheat, electric circulator; Configuration B—Steam reheat, high pressure steam-driven circulator; and Configuration C—Gas reheat, intermediate pressure steam-driven circulator.

44659 Importance of the high-temperature reactor for the future energy market. Schulten, R. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). pp 22-26 of Konferenz ueber Energie und technologische Entwicklung: die Loesung der Energiekrise. Wiesbaden, Germany, F.R.; Campaigner Verl. (1977). (In German)

From Conference on energy and technological development) solution to the energy crisis; Essen, F.R. Germany (6 Jun 1977).

A simple market mechanism which has formerly led to decisions on the energy market is now being regarded as a doubtful means for the great decisions for the future that must be taken during the next few decades. However, these decisions are necessary in the long-term preparations required for the introduction of the future energy systems. The following questions are discussed in this context: 1) How much energy will be needed. 2) Which type of primary energy may be used. 3) Which energy sytems may be applied. 4) Will nuclear energy be able to solve its safety problems and the problem of uranium supply. 5) When will it be possible to introduce a new energy system.

44660 Calculations of neutron radiation levels from HTGR spent fuel. Sund, R.E.; Engholm, B.A.; Su, S. (General Atomic Co., San Diego, CA). pp 865-872 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Shielding calculations were performed for neutrons from Peach Bottom HTGR (High Temperature, Gas-Cooled Reactor) spent fuel. The neutron source terms were determined from calculated curie values for ^{238}Pu, ^{242}Cm, and ^{244}Cm; the neutron yield for the spontaneous fission of ^{242}Cm and ^{244}Cm; and the neutron yields for carbon and oxygen (α,n) reactions. Depending upon the experimental configuration, the shielding computations were performed with a one-dimensional coupled discrete ordinates and diffusion code (CTD), a two-dimensional diffusion code (2DB), and a Monte Carlo code (MORSE). The three calculational methods gave results that are typically one-half of experimental values. The results possibly indicate that the accuracy of the cross-section data used in the calculation of the curie values is in doubt.

POWER REACTORS, NON-BREEDING, OTHERWISE MODERATED OR UNMODERATED

44661 (AECL—4436/1) **Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 1: starting materials: uranium ore, separated uranium and uranium mill tailings, and Part 2: irradiated fuel.** Clegg, L.J.; Coady, J.R. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jan 1977. vp. Dep. NTIS (US Sales Only), PC A17/MF A01.

The computer code CANIGEN was used to obtain the mass, activity, decay heat and toxicity of CANDU fuel and its component isotopes. Data are also presented on gamma spectra and neutron emissions. Part 1 presents these data for unirradiated fuel, uranium ore and uranium mill tailings. In Part 2 they have been computed for fuel irradiated to levels of burnup ranging from 140 GJ/kg U to 1150 GJ/kg U.

44662 (AECL—5391) **Study of the running-in period of a CANDU-PHW thorium converter.** Dormuth, K.W.; Lidstone, R.F. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Aug 1977. 43p. Dep. NTIS (US Sales Only), PC A03/MF A01.

One of the concepts being studied as part of an evaluation of advanced fuel cycles for the Canadian nuclear power program is that of a Candu reactor whose initial fuel is a mixture of thorium and plutonium and whose bred uranium is recycled back to the same core with plutonium topping. From start-up of this reactor, when the fuel contains no uranium, to the attainment of equilibrium, when the uranium content of the feed fuel becomes constant, the core is in a

transitional state because the composition of the feed fuel is changing. Since this so-called running-in period constitutes a large portion of the reactor life, it is essential that it be accounted for in fuel management calculations. The presence of the relatively long-lived intermediate nuclide, ^{233}Pa, in the thorium conversion chain complicates such calculations, because it causes the concentration of the important fissile isotope, ^{233}U, to depend rather strongly on flux history. A computational method based on the lattice code, WIMS, and the one-dimensional diffusion-depletion code, FEVER-7, has been developed and used to analyse the running-in period of a 1200 MWe $(Th,Pu,U)O_2$-fuelled CANDU-PHW.

44663 (AECL—5679) **Overview of the potential of the CANDU reactor as a thermal breeder.** Slater, J.B. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Feb 1977. 19p. (CONF-7609177—1). Dep. NTIS (US Sales Only), PC A02/MF A01.

From Meeting on the status and prospects of thermal breeders; Vienna, Austria (15 Sep 1976).

This paper is concerned with the use of thorium as a fuel in the existing CANDU concept. The neutron balance of the reactor core is analyzed and an assessment is made of the potential for development of a thermal 'breeder' reactor system. It is concluded that while the SSET cycle (i.e. self-sufficient equilibrium thorium cycle) appears feasible, there is little potential for developing a significant 'breeding' fuel cycle if current reactor operating capability and capital costs are to be maintained.

44664 (AECL—5680) **Dynamic simulation of a reboiler.** Moeck, E.O.; McMorran, P.D. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Jul 1977. 10p. (CONF-770761—1). Dep. NTIS (US Sales Only), PC A02/MF A01.

From 4. symposium on multivariable technological systems; Fredericton, Canada (Jul 1977).

A hybrid-computer simulation of reboiler dynamics was prepared, comprising models of steam condensation in tubes, heat conduction, steam generation, a surge tank, steam transmission line and flow-control valve. Time and frequency responses were obtained to illustrate the dynamics of this multivariable process.

44665 (AECL—5800, pp 49-67) **Decommissioning of CANDU nuclear stations.** Unsworth, G.N. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Apr 1977.

In Nuclear power: the Canadian issues. A submission from Atomic Energy of Canada Limited to The Royal Commission on Electric Power Planning in response to The Commission's Issue Paper No. 1 'Nuclear power in Ontario'.

Several scenarios are presented for decommissioning of a 600 MW(e) CANDU power station. Time and cost estimates are given. Problems peculiar to the art like activity, decontamination, and dismantling procedures are analyzed. Man-rem exposures are predicted.

44666 (AECL—5800, pp 3-9) **Unique characteristics of CANDU nuclear reactors.** Weaver, K.R. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). Apr 1977.

In Nuclear power: the Canadian issues. A submission from Atomic Energy of Canada Limited to The Royal Commission on Electric Power Planning in response to The Commission's Issue Paper No. 1 'Nuclear power in Ontario'.

The CANDU type reactor, by virtue of its use of natural uranium and a core built up of individual fuel channels, is inherently controllable with rather modest systems which operate in the mild temperature and pressure regimes of the moderator system. Barriers to escape of radioactivity into the environment are: the ceramic-like matrix of the uranium dioxide itself, the zirconium alloy fuel sheath, the heat transport system, and the reactor building-vacuum building containment system. Shutdown can be accomplished by either dumping the moderator or employing mechanically driven shut-off rods. Quality assurance and redundancy assure system reliability and safety.

44667 (AECL—5800, pp 87-94) **Prospects for future CANDU fuel cycles.** Hatcher, S.R. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Apr 1977.

In Nuclear power: the Canadian issues. A submission from Atomic Energy of Canada Limited to The Royal Commission on Electric Power Planning in response to The Commission's Issue Paper No. 1 'Nuclear power in Ontario'.

Uranium supply and demand in Canada is forecast. In this context, the advantage of plutonium recycle and thorium-U-233 breeding and recycle in CANDU reactors is to extend our supplies of nuclear fuels by two and four times, respectively. This technology poses two challenges which once-through fuelling does not, i.e. disposal of reprocessing wastes and fabrication of radioactive fuels. Once-through fuelling appears to be feasible until the next century.

44668 (AECL—5823) **Effects of various treatments on the serviceability of water-immersed carbon-steel ball bearings.** Wensel, R.G. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Jun 1977. 25p. Dep. NTIS (US Sales Only), PC A03/MF A01.

Carbon-steel ball bearings employing various coatings, surface treatments, lubricants and ball and separator materials were tested under conditions simulating those in the NPD/Bruce type fuelling machine heads. The effects of the treatments on operating torques and wear and corrosion rates were studied. Sealed bearings lubricated with Dow FS 3451 (a fluorosilicone grease) gave the best performance in terms of these parameters.

44669 (AECL—5824) **Testing of unlubricated water-immersed carbon-steel ball bearings.** Wensel, R.G. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Jul 1977. 20p. Dep. NTIS (US Sales Only), PC A02/MF A01.

Wear data for untreated, chemically oxidized, autoclave oxidized, and hard chromium plated ball bearings operating in water at different radial loads, speeds and water temperatures are presented. Results were highly variable, even for replicated tests, making wear results difficult to interpret. Within the ranges used in these tests, load, speed and water temperature had no consistent effect on wear rate or operating torque. One treatment, the Du-Lite process, resulted in a significant reduction in wear rate. All oxide-forming treatments studied, resulted in improved corrosion resistance.

44670 (AECL—5825) **Measurement of a relative conversion ratio in 19-element ThO_2-UO_2 fuel.** Jones, R.T. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Jun 1977. 29p. Dep. NTIS (US Sales Only), PC A03/MF A01.

A relative conversion ratio has been measured for 19-element D_2O cooled ThO_2 - 1.45% UO_2 (93.2% enriched) bundles of the Douglas Point G.S. geometry in ZED-2. A single rod of the ThO_2-UO_2 fuel was used surrounded by eight nearest neighbours containing D_2O cooled standard natural UO_2 Douglas Point bundles. Wafers of the fuel material and Th metal foils were irradiated in a demountable fuel bundle and counted for fission product activity using a NaI (Tl) detector system. Pa^{233} activity was counted using the NaI (Tl) system and a Ge(Li) detector; the two methods were compared. The bundle average relative conversion ratio was found to be 1.177 +- 0.009.

44671 (AECL—5826) **Flow-induced vibration analysis of heat exchanger and steam generator designs.** Pettigrew, M.J.; Sylvestre, Y.; Campagna, A.O. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Aug 1977. 13p. (CONF-770807—57). Dep. NTIS (US Sales Only), PC A02/MF A01.

From 4. international conference on structural mechanics in reactor technology; San Francisco, CA, USA (15 Aug 1977).

Tube and shell heat exchange components such as steam generators, heat exchangers and condensers are essential parts of CANDU nuclear power stations. Excessive flow-induced vibration may cause tube failures by fatigue or more likely by fretting-wear. Such failures may lead to station shutdowns that are very undesirable in terms of lost production. Hence good performance and reliability dictate a thorough flow-induced vibration analysis at the design stage. This paper presents our approach and techniques in this respect.

44672 (AECL—5833) **Flux distribution measurements in the Bruce A unit 1 reactor.** Okazaki, A.; Kettner, D.A.; Mohindra, V.K. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Jul 1977. 30p. Dep. NTIS (US Sales Only), PC A03/MF A01.

Flux distribution measurements were made by copper wire activation during low power commissioning of the unit 1 reactor of the Bruce A generating station. The distribution was measured along one diameter near the axial and horizontal midplanes of the reactor core. The activity distribution along the copper wire was measured by wire scanners with NaI detectors. The experiments were made for five configurations of reactivity control mechanisms.

44673 (AECL—5852) **Flow-induced vibration of nuclear power station components.** Pettigrew, M.J. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Sep 1977. 62p. Dep. NTIS (US Sales Only), PC A04/MF A01.

Several components of CANDU nuclear power stations are subjected to relatively high flow velocities in either liquid or two-phase (steam/water) flow. Typical of such components are the nuclear fuel in the fuel channels and tube bundles in the steam generators. Fretting-wear, fatigue, acoustic noise and operational difficulties are the problems caused by flow-induced vibration. Some recent problems such as fretting of steam generator tubes are reviewed. The vibration excitation mechanisms predominant in parallel and transverse flow are discussed and formulated. In parallel flow two basic vibration excitation mechanisms are considered, namely random excitation due to flow turbulence and fluidelastic instability.

The above and periodic wake shedding are considered in cross-flow. Our approach to the vibration analysis of nuclear components is presented. This is illustrated by the vibration analysis of steam generator designs. Current investigations related to flow-induced vibration are outlined. This includes the experimental study of the in-reactor vibration behaviour of fuel elements.

44674 (AECL—5853) **Adjuster rod experiments in ZED-2.** Jones, R.T. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Aug 1977. 40p. Dep. NTIS (US Sales Only), PC A03/MF A01.

Measurements on mock-up adjuster rods were made in a ZED-2 core of 52 28-element D_2O cooled fuel rods on a square pitch of 28.575 cm. Reactivity worths were obtained from critical height and level coefficient of reactivity measurements. Flux distributions on and about the absorbers and throughout the reactor core were obtained.

44675 (AECL—5904) **Tables of the isotopic composition of transuranium elements produced in Canadian D_2O moderated reactors.** Milgram, M.S.; Sly, K.N. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Aug 1977. 19p. Dep. NTIS (US Sales Only), PC A03/MF A01.

Tables of the calculated isotopic concentration of U^{235}, U^{236}, Np^{237}, Pu^{238}, Pu^{239}, Pu^{240}, Pu^{241}, Pu^{242}, Am^{241}, and Cm^{242} as a function of irradiation are given for five of the standard CANDU reactor types. Estimates are reported of the errors to be expected in the calculated quantities. This report is intended to serve as a revision to AECL-2631.

44676 (AECL—5913) **Valve maintainability in CANDU-PHW nuclear generating stations.** Pothier, N.E.; Crago, W.A. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Sep 1977. 20p. (CONF-7709131—1). Dep. NTIS (US Sales Only), PC A03/MF A01.

From Symposium on nuclear plant maintainability; Montreal, Quebec, Canada (Sep 1977).

Design, application, layout and administrative factors which affect valve maintainability in CANDU-PHW power reactors are identified and discussed. Some of these are illustrated by examples based on prototype reactor operation experience. Valve maintainability improvements resulting from laboratory development and maintainability analysis, have been incorporated in commercial CANDU-PHW nuclear generating stations. These, also, are discussed and illustrated.

44677 (CONF-760688—, pp 112-129) **Support required from Canada in the operation and maintenance of CANDU stations overseas.** Craik, N.G.; Knapp, G.A. (Canatom Ltd.). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 4: nuclear energy and the industry (part 1).

The long-term support required from Canada in the operation and maintenance of overseas CANDU nuclear generating stations after commercial operation has commenced is described, with reference entirely to the KANUPP reactor. This includes: technical support to station staff to increase plant reliability and maintainability; assistance with plant improvements; procurement of spares and consumables; and assistance with training programmes. This technical support may be provided by a small number of Canadian staff actually resident at the power station; by short-term visits of Canadian specialists to site and by technical and procurement services provided from Canada. Examples of technical problems experienced are given, showing typical services required from Canada.

44678 (CONF-760688—, pp 33-45) **Delayed hydrogen cracking of zirconium alloy pressure tubes.** Jackman, A.H. (Ontario Hydro); Dunn, J.T. (Atomic Energy of Canada Limited). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 6: heavy water reactors.

An episode of pressure tube cracking in Pickering units 3 and 4 is analyzed in terms of delayed hydrogen cracking potentiated by high stresses imposed by improper joint rolling technique. Stress relieving procedures are described for Bruce units 1 and 2.

44679 (CONF-760688—, pp 1-26) **Influence of design and regulatory code changes on a 'repeat' project - Pickering G.S. 'B'.** McCredie, J. (Ontario Hydro). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 2: nuclear energy - current evolutions.

The Pickering 'B' generating station is described with reference to differences from Pickering 'A' occasioned by changes in regulatory codes, perceived opportunities for capital cost savings, and changes indicated by operating experience.

44680 (CONF-760688—, pp 1-32) **Heavy water nuclear station design.** Morison, W.G. (Ontario Hydro). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 6: heavy water reactors.

The design and characteristics of CANDU type reactors are described, with reference to existing CANDU power plants.

44681 (CONF-760688—, pp 1-11) **Review of problems in nuclear industrial expansion.** Parfitt, A.W.; Robinson, J. (CNA Economic Committee). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 5: nuclear energy and the industry (part 2).

Domestic financial restraints and politicizing of the export market have slowed the growth of the Canadian nuclear industry. Industry spokesmen are calling for definite government policies to stabilize the industry. Specialization and high quality standards make free competition infeasible. Standardization of unit sizes and components is urgently called for. Large unit sizes have many drawbacks for industry.

44682 **Nuclear reactor fuel management.** Bhatti, R.A. Lexington, KY; Univ. of Kentucky (1977). 201p. University Microfilms Order No. 78-06,356.

Thesis (Ph. D.).

The HAMBUR code was developed by the Savannah River Laboratory as a result of the need to treat cases for single pin fuel cell when the spectrum is strongly distorted and the self-shielding variations during the life of the core become important, as in the case of plutonium and thorium fuel cycles. This code relies on basic nuclear cross-sections data and calculates a few group data taking into account the microscopic and macroscopic variations of spectrum for different burnup. In order to extend the burnup of discharged fuel elements from the present light water reactors to the heavy water reactors, the use of the HAMBUR code for single pin fuel elements in light water reactors was extended to clustered fuel elements in gas cooled and heavy water reactors. The HERESY-III code was then used for reactivity and power calculation. An error arises in reactivity and flux distributions when this code is applied to a finite reactor due to the use of infinite medium slowing down and thermal diffusion kernels. Analytical expressions for these kernels were derived for a finite medium and the HERESY-III code was modified using these kernels. In order to know the accuracy of computer codes used for cell and flux calculations, the output data from modified HAMBUR and HERESY codes were combined to simulate equilibrium operation of the Pickering reactor.

44683 **Contribution of fission products to radiation fields in a pressurized heavy water reactor.** Neil, B.C.J. (Ontario Hydro, Toronto). pp 401-408 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Radiation fields from process equipment of water-cooled nuclear power reactors during shutdown have mostly been associated with activated corrosion products, particularly ^{60}Co. Few instances have been reported where fission products have been of continuing concern. Studies at Ontario Hydro's Pickering Nuclear Generating Station have shown that fission products make significant and sometimes major contributions to that station's heat transport system radiation fields. Gamma spectra were obtained during reactor shutdowns at various locations using a portable high purity germanium detector. These showed that radiation fields from components affected by failed fuel had appreciable contributions from deposited fission products such as ^{95}Zr, ^{95}Nb and ^{140}La. Correlations are made between shutdown radiation fields from fission products and the ^{131}I concentration in the circulating water prior to shutdown. The magnitude of the radiation fields due to fission products is shown to depend mainly on the number of fuel elements present with cladding failures, the severity of the failures and the length of time the reactor has been operating with failed fuel present. It is concluded that as the causes of activated corrosion product buildup are found and corrected, fission products may become the major source of radiation fields. If full advantage is to be taken of reduced activated corrosion product contamination, improvements are required both in fuel defect performance and in the location and removal of defected fuel.

44684 **Methods of calculation used in the design of the shielding within the primary containment of a commercial S.G.H.W.R.** Dutton, L.M.C.; Solari, P.A. (Nuclear Power Co. Ltd., Risley, Eng.). pp

545-553 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The first Commercial Steam Generating Heavy Water Reactor is used to illustrate the methods that are currently employed in the design of power reactor shielding. A description is given of the primary shields, their more important penetrations and the associated design criteria. The way in which different techniques have been used for various aspects of the design is described, including damage rates to some important components; and typical results are presented.

POWER REACTORS, BREEDING

REFER ALSO TO CITATION(S) 44654, 44799, 44800, 44807, 44813, 44821, 44831, 45013, 45091

44685 (AI-DOE—13231) **Sodium technology and cover gas seal development programs. Quarterly technical progress report, January—March 1978.** (Atomics International Div., Canoga Park, Calif. (USA)). 30 Apr 1978. Contract EY-76-C-03-0824-025. 41p. AT.

Progress is reported in the following study areas: sodium evaporation process development, decontamination studies, advanced seal materials, and gamma irradiation effects on seal materials. Some of the studies were aimed specifically at FFTF or CRBR component development.

44686 (ANL—77-82) **Computation of the weight function from a stress intensity factor.** Petroski, H.J.; Achenbach, J.D. (Argonne National Lab., Ill. (USA)). Oct 1977. Contract W-31-109-ENG-38. 28p. Dep. NTIS (US Sales Only), PC A03/MF A01.

A simple representation for the crack-face displacement is used to compute a weight function solely from stress intensity factors for a reference loading configuration. Crack-face displacements given by the representation are shown to be in good agreement with analytical results for cracked tensile strips, and stress intensity factors computed from the weight function agree well with those for edge cracks in half-planes, radial cracks from circular holes, and radially cracked rings. The technique involves only simple quadrature, and its efficacy is demonstrated by the example computations. The weight function for a corner crack in an LMFBR hexagonal subassembly duct is constructed from stress-intensity-factor results for the uniformly overpressurized case, and it is shown how this may be used to determine the stress intensity factors for other loading cases.

44687 (ANL—78-41) **Comparisons of sodium void and Doppler reactivities in large oxide and carbide LMFBRs.** Su, S.F. (Argonne National Lab., Ill. (USA)). Mar 1978. Contract W-31-109-ENG-38. 64p. Dep. NTIS, PC A04/MF A01.

Sodium void and Doppler reactivities in two full scale (3000 MWth) LMFBRs are analyzed; one is fueled with UO_2 - PuO_2 and the other is fueled with UC - PuC. These two reactors are analyzed for beginning of life as well as for beginning and end of equilibrium cycle conditions, and the variations of these two safety parameters with burnup are explained. A series of comperative analyses of these two and several hypothetical reactors are carried out to determine how differences in fuel type, sodium content, and heavy metal concentration between an oxide and a carbide reactor affect their sodium void and Doppler reactivities. The effect of the presence of conrol poison on sodium void reactivity is also addressed.

44688 (CONF-780440—1) **Role and progress of the Clinch River Breeder Reactor Plant.** Nolan, J.E.; Goeser, D.K. (Westinghouse Electric Corp., Oak Ridge, Tenn. (USA). Advanced Reactors Div.). 1978. Contract EY-76-C-15-2395;EY-76-C-15-0003. 12p. Dep. NTIS, PC A02/MF A01.

From American power conference; Chicago, IL, USA (Apr 1978).

The Clinch River Breeder Reactor Plant plays a vital role in the development of an LMFBR industry by demonstrating the technical performance, reliability, maintainability, safety, environmental acceptability and economic feasibility of an LMFBR central station power plant in a utility environment and confirms the value of the LMFBR in conserving natural resources. Activities already completed on the CRBRP Project have supported the attainment of these objectives in fulfilling the role of the CRBRP. In particular, the licensing interactions with the NRC leading to the issuance of a favorable or environmental acceptability (FES), the development of an industrial base of qualified component suppliers, and the completion of system and component designs, have all shown the ability of the CRBRP to meet its objectives. The most striking achievements on the CRBRP to date have been the completion of component designs and the considerable progress in component fabrication. Many of the major components are 50% or more through the fabrication process. The capability of the Project to maintain cost and schedule in these component procurements has been a major achievement and provides a solid basis for establishing the commercial viability of the LMFBR.

44689 (COO—2245-36TR) **Collection and evaluation of salt mixing data with the real time data acquisition system.** Glazer, S.; Chiu, C.; Todreas, N.E. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). Sep 1977. Contract EY-76-S-02-2245. 331p. Dep. NTIS, MF A01.

Portions of document are illegible.

A minicomputer based real time data acquisition system was designed and built to facilitate data collection during salt mixing tests in mock ups of LMFBR rod bundles. The system represents an expansion of data collection capabilities over previous equipment. It performs steady state and transient monitoring and recording of up to 512 individual electrical resistance probes. Extensive real time software was written to govern all phases of the data collection procedure, including probe definition, probe calibration, salt mixing test data acquisition and storage, and data editing. Offline software was also written to permit data examination and reduction to dimensionless salt concentration maps. Finally, the computer program SUPERENERGY was modified to permit rapid extraction of parameters from dimensionless salt concentration maps. The document describes the computer system, and includes circuit diagrams of all custom built components. It also includes descriptions and listings of all software written, as well as extensive user instructions.

44690 (GA-A—14766) **Thermal stress analysis of the 300-MW(e) gas-cooled fast breeder reactor grid plate.** Chuang, A.S.; Chang, K.H. (General Atomic Co., San Diego, Calif. (USA)). Mar 1978. Contract EY-76-C-03-0167-023. 73p. Dep. NTIS, PC A04/MF A01.

A thermal stress analysis of the 300-MW(e) gas-cooled fast breeder reactor (GCFR) grid plate was performed to (1) assess the ligament stresses of the grid plate due to the thermal load generated by gamma heating from the reactor core, (2) determine the temperature-induced deflection of the grid plate and the resulting deformations of the core for reactivity changes and for space envelope effects on interfacing components, and (3) evaluate irradiation-induced swelling of the grid plate. A parallel study was conducted in which a theoretical method and a finite-element analysis were employed. The theoretical approach used a simplified model for the grid plate, and analyses were carried out using the concept of an equivalent solid material. The solid rim effect was added to account for the in-plane force generated by the rim due to a thermal expansion which was greater than that of the interior portion of the grid plate. The temperature in the grid plate varied in the axial and radial directions in an axisymmetric pattern. In the finite-element analysis, the perforated portion of the grid plate was treated as an equivalent solid plate with effective elastic constants, and at the outer rim the solid material properties were retained. Discrete temperature data were assigned at each mode of the finite-element model. The results of both approaches are discussed.

44691 (GEFR—00027(L)) **Interim evaluation of Sodium—Water Reaction Test No. 1 data and comparison with TRANSWRAP analyses: Series I large leak test program.** Amos, J.C.; McClelland, S.D.; Regimbal, J.J. (General Electric Co., Sunnyvale, Calif. (USA). Fast Breeder Reactor Dept.). 28 Feb 1977. Contract EY-76-C-03-0893-010. 65p. AT.

The report presents an interim evaluation and analytical comparison of the test data and intertest examination results for Sodium Water Reaction (SWR) Test No. 1 (SWR No. 1) conducted in the Large Leak Test Rig (LLTR) at the Liquid Metal Engineering Center (LMEC). Efforts to achieve a more detailed evaluation of SWR No. 1 are underway. Comparisons with the experimental findings of subsequent tests in the series, similar to this evaluation, are planned. A final Series I evaluation report will be prepared following completion of the Series I test program. The test was the first of the Series I large leak tests utilizing the MSG test article. The test consisted of a programmed double-ended guillotine rupture of a centrally located steam generator tube at a location 4'10$^3/_4$" above the MSG lower tubesheet. Pretest conditions for both water and sodium in the test article were representative of CRBRP evaporator operating conditions. Dynamic H_2O flow conditions were established in the rupture tube, with static (uniform) steam pressure in the remaining steam generator tubes. A representative 225° linear temperature gradient was established over the length of the shell.

44692 (GEFR—00351) **Localized duct wall cyclic thermal stresses in vented assembly LMFBR cores.** Dubberley, A.E. (General Electric Co., Sunnyvale, Calif. (USA). Fast Breeder Reactor Dept.). Dec 1977. Contract EY-76-C-03-0893-031. 85p. AT.

A vented assembly differs from a standard assembly only by having one or more vents machined into the duct wall at positions above the active core. The vents below the Above Core Load Pads (ACLP's) allow coolant to leave the assembly and pressurize the

interstitial spaces between the assemblies before flowing up past the load pads and exiting to the upper plenum. Additional vents above the ACLP's further reduce the assembly pressure drop. Two primary benefits are anticipated from a core composed of vented assemblies. First, a pressurized interstitial space reduces the pressure across the assembly duct wall, reducing duct stress and deflection and allowing either longer dilation life or a thinner duct wall. The second benefit is a reduced pressure drop between the reactor inlet and outlet plenum for the same core coolant mass flow rate. The flow exiting from the assemblies at the vents and following a "parallel" hydraulic path through the interstitial region to the outlet plenum reduces the mass flow rate and thus the pressure drop in the upper portion of the assemblies. The greater the bypass flow leaving the vents, the greater the reduction in assembly pressure drop will be.

44693 (HEDL-SA—1321) **Design and economics of large LMFBRs.** Omberg, R.P.; Cantley, D.A.; Last, G.A.; Squire, A.; Lowery, V.W. (Hanford Engineering Development Lab., Richland, Wash. (USA); Energy Research and Development Administration, Washington, D.C. (USA). Div. of Reactor Development and Demonstration). Jun 1977. Contract EY-76-C-142-2170. 31p. (CONF-771123—3). Dep. NTIS, PC A03/MF A01.

From BNES conference on optimization of sodium cooled fast reactors; London, UK (28 Nov 1977).

The design of an LMFBR core is a complex process which is strongly dependent upon design philosophy, design criteria, material properties, and the calculational procedure involved. The development of a core design with optimum characteristics, whether it be a minimum doubling time, a minimum power cost, or a minimum sodium void worth, requires a close coupling of the disciplines of reactor physics, thermohydraulics, mechanical design, and fuel pin performance. This is true regardless of whether the fuel is oxide, carbide, nitride, or metal, and regardless of whether the fuel cycle is Pu/U or U-233/Th.

44694 (HEDL-SA—1326) **Tritium permeation through oxidized 304 and 316 stainless steel.** McGuire, J.C. (Hanford Engineering Development Lab., Richland, Wash. (USA)). Jan 1978. Contract EY-76-C-14-2170. 27p. (CONF-780213—10). Dep. NTIS, PC A03/MF A01.

From 107. AIME meeting; Denver, CO, USA (26 Feb 1978).

This work was completed during the course of a cooperative program on Tritium Transport in Liquid Metal Cooled Reactors. This work considers conditions encountered in operating reactors. It involves hydrogen, deuterium and tritium permeation measurements on "clean" and oxidized surfaces. The tritium measurements were restricted to permeation rates from sodium and through the test membrane at concentrations typical of EBR-II reactor experience. The hydrogen and deuterium work measured permeation rates at gas pressures from 13-1300 Pa (0.1 to 10 Torr). Permeation rates were measured for tritium permeation through oxidized 304 and 316 stainless steel. The tritium was injected into hot flowing sodium at concentrations near present sodium cooled reactor operating levels. Permeation data are presented as a function of temperature, oxidation time and tritium activity level in the sodium. Permeation rates were determined at 590, 540 and 480°C and at tritium concentrations varying from 1 to 40 x 10^{-9} CiT_2/gmNa (3.4 x 10^{-8} to 1 x 10^{-6} ppM). At 540°C tritium diffusion rates for both ozidized steels were in the range 1-2 x 10^{-4} cc-mm/hr-cm^2-$atm^{1/2}$. Response at this concentration varied as the square root of pressure. However hydrogen (H_2) and deuterium permeation tests at 1300 to 13 Pa (10 to 0.1 Torr.) showed linear response to changes in this higher pressure range.

44695 (HEDL-SA—1391) **Friction, wear, and corrosion of laves-hardened nickel alloy hardsurfacing in sodium.** Johnson, R.N.; Farwick, D.G. (Hanford Engineering Development Lab., Richland, Wash. (USA)). 1978. Contract EY-76-C-14-2170. 23p. (CONF-780430—6). Dep. NTIS, PC A02/MF A01.

From Conference on metallurgical coatings; San Francisco, CA, USA (3 Apr 1978).

This paper represents the results of friction, wear, and corrosion tests on Tribaloy 700 specimens. The Tribaloy alloys are a family of materials typically consisting of a hard, intermetallic Laves phase dispersed in a cobalt or nickel eutectic or solid solution matrix. Only one alloy of the Tribaloy series, Tribaloy 700, is a cobalt-free nickel-base alloy. Tribaloy 700 is therefore of interest for nuclear reactor applications, where cobalt must be restricted. Tribaloy 700 rubbing against itself in sodium exhibited among the lowest friction coefficients measured for metallic materials at high temperature. Detonation-gun coatings had lower friction and lower corrosion rates than plasma coatings, in general. The wear rate of Tribaloy 700 was negligible. Surface damage resistance was good, especially when in contract with itself or other hard materials. The material also exhibited low corrosion rates in sodium.

44696 (KFK—2483) **SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles.** Martelli, A. (Kernforschungszentrum Karlsruhe (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe (Germany, F.R.). Projekt Schneller Brueter). Aug 1977. 362p. (EUR—5510e). Dep. NTIS (US Sales Only), PC A17/MF A01.

This paper is a guide for the users of the Fortran computer code SAGAPO, which has been developed by the author for the thermo-fluiddynamic analysis of gas cooled fuel element bundles. The physical models and the mathematical procedures used in SAGAPO have been already described by the author of this work in a previous paper. Thus this work contains only a description of the structure of the code, together with the other informations necessary to the users. A listing of SAGAPO is included in the appendix, together with an example of input preparation and parts of printed results.

44697 (WAPD-TM—1130) **Detection of radioactive surface and weld contamination (ThO_2 and $^{233}UO_2$) on light water breeder reactor fuel rods using alpha ionization detectors (LWBR development program).** Kikta, T.J. (Bettis Atomic Power Lab., West Mifflin, Pa. (USA)). Mar 1978. Contract EY-76-C-11-0014. 16p. Dep. NTIS, PC A02/MF A01.

To minimize the radioactivity in the primary water of nuclear reactors and prevent local corrosion on reactor fuel rods, inspection techniques are required to detect any fuel materials deposited on the fuel rod surfaces during manufacture. This report provides the description and operational features of a large 4π geometry alpha detector capable of inspecting fuel rods up to 10 feet long and 1 inch in diameter. The system allows the inspection of fuel rods with a minimum of delays for loading and unloading the detector. The sensitivity is sufficient to detect minute amounts of fuel materials remaining on the fuel rod after manufacturing and testing operations down to the level of the natural radioactivity of the Zircaloy cladding material.

44698 (WAPD-TM—1134) **Method for measurement of relative differences in thermal expansion coefficients (LWBR development program).** Alexander, J.E. (Bettis Atomic Power Lab., Pittsburgh, Pa. (USA)). Jun 1978. Contract EY-76-C-11-0014. 14p. Dep. NTIS, PC A02/MF A01.

The report describes a test which was conducted to determine the variation in thermal expansion coefficients of specimens from several material heats of Type 304 stainless steel. The purpose of this document is to identify the procedures, equipment, and analysis used in performing this test. From a review of the data which were used in establishing the values given for mean coefficient of thermal expansion in the 1968 ASME Boiler and Pressure Vessel Code, Section III, a +-3.3-percent maximum variation was determined for Type 304 CRES in the temperature range of interest. The results of the test reduced this variation to +-0.53 percent based on a 95/99-percent tolerance interval for the material tested. The testing equipment, procedure, and analysis are not complicated and this type of test is recommended for applications in which the variation in thermal expansion coefficients is desired for a limited number of material heats.

44699 (WARD-RB—3045-22) **Radial blanket design and development quarterly progress report for period ending November 30, 1977.** Bishop, E.C. (Westinghouse Electric Corp., Madison, Pa. (USA). Advanced Reactors Div.). Jan 1978. Contract EY-76-C-02-3045-004. 74p. AT.

Summaries of prior work and current progress are presented for the following task areas: (1) radial blanket assembly heat transfer testing, (2) radial blanket assembly irradiation, (3) radial blanket flow orificing, and (4) radial blanket rod bundle compaction tests. (DG)

44700 **BN-350 reactor shielding studies.** Bakumenko, O.D.; Zvonarev, A.V.; Kulakovskii, M.A. pp 494-500 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

This paper presents the results from experimental and calculational studies carried out at the BN-350 reactor start-up with the aim of determining the efficiency of intra-vessel and biological shielding of the reactor: distributions of reaction rates for various indicators in the upper reactor shield, specific activity values for reactor coolant and gas system, radiation situation within primary circuit cells and in the rooms adjacent to the reactor. The experimental data obtained are compared with the calculated ones.

44701 **Shield design and streaming calculations for the sodium cooled PEC reactor.** Prosperi, M. (AGIP Nucleare, Milan); Tavoni, R.; Travaglini, N. pp 554-562 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

This paper summarises the shielding calculations carried out for the PEC reactor. A brief description of calculation methods and of the work carried out to set them up is given; the most representative calculations with the relative isoflux curves are also referred. A general outline is then given for the main shielding problems of the PEC reactor.

44702 Study of applicability of an albedo Monte Carlo method for neutron streaming calculation. Kawai, M. (Nippon Atomic Industry Group Co., Ltd., Kawasaki, Japan); Yamauchi, M.; Kadotani, H.; Suzuki, I. pp 636-644 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The applicability of albedo Monte Carlo (AMC) method for the calculation of neutrons streaming through cavities and ducts in LMFBR shielding materials was studied. In the present AMC calculation, MORSE-CG code was modified to include the energy-angle dependent differential albedo data, which were generated by ad hoc versions of ANISN code and SLDN code (invariant imbedding method). SLDN code can calculate exactly the albedo data for semi-infinite slab about 100 times as fast as ANISN code. As sample problems, neutron streaming through a sodium straight pipe and a sodium stepped annular pipe penetrating the shielding materials were chosen because the models can be solved exactly by a two-dimensional Sn transport code. It was found that the total neutron fluxes obtained by the AMC calculation agree with those by S_{16} calculation within a statistical error of AMC calculation and that the fast neutron spectrum was affected by the albedo boundary position. As an application, a problem of neutrons streaming through a large void surrounded by concrete was calculated.

44703 Development of a computer code for neutron streaming calculation in LMFBR. Nishimura, T.; Kinjo, H. (Mitsubishi Atomic Power Industries, Inc., Ohmiya, Saitama, Japan). pp 680-687 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

A practical computer code MADONNA has been developed for neutron streaming calculations in LMFBR shielding with various shapes of void. The code is based upon a modified removal diffusion method coupled with an albedo-transport equation. To facilitate the solution of the albedo-transport equation, the kernel-albedo and the line-of-sight techniques are incorporated. The comparison has been made between this code and a more rigorous discrete ordinates code in a typical reactor shield. The result is quite satisfactory.

44704 Results of neutron propagation in steel sodium mixtures with various source spectra on Harmonie and Tapiro. Calamand, D. (CEA, Cadarache, France); Desprets, A.; Rancurel, H. pp 795-803 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The first results of a joint CEA/CNEN neutron propagation program conducted on the source reactors HARMONIE and TAPIRO are presented. In both cases, a buffer zone representative of the blanket of a commercial fast power reactor is interposed between the source reactor and the medium in which neutron propagation is measured. This buffer zone provides a realistic source spectrum to be propagated. Experimental results are compared to older results obtained without the buffer zone. The effect of the source spectrum on neutron propagation is discussed, as well as the coherence of the results obtained with the two installations.

44705 Integral data for the prediction of neutron propagation in iron—sodium mixtures. Estiot, J.C. (CEA, Cadarache, France); Trapp, J.P.; Palmiotti, G.; Salvatores, M. pp 804-811 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

This paper presents results of the first stage in the adjustment procedure used to improve the performances of the neutron propagation calculational scheme PROPANE, in a joint effort between CEA and CNEN. For this purpose, integral data for neutron propagation in pure iron and in iron-sodium mixtures are used. The calculational hypothesis and the adjustment procedure are discussed. The performances of this new version of PROPANE are compared to those of the non adjusted one.

44706 UK fast reactor shield design and performance. Butler, J. (United Kingdom Atomic Energy Authority, Winfrith, Eng.); Brindley, K. pp 819-832 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The development of new methods and data-sets for the shield design of CFR1 is described. The calculational routes are being validated using measurements made in mock-ups of large cores on ZEBRA, penetration benchmarks in the ASPIS bulk shield facility, and special thimbles irradiated in the PFR.

44707 Two-dimensional shielding benchmarks for sodium and iron at Yayoi. Oka, Y. (Tokyo Univ.); An, S.; Kasai, S.; Sakata, S.; Miyasaka, S.; Koyama, K.; Hyodo, T. pp 833-840 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Two dimensional distributions of neutron flux and gamma ray dose were measured at the fast neutron source reactor "YAYOI" for two types of shields. One is a 1.8m thick, 1m square sodium shield and the other is a 70m thick, 1m square iron shield. The measurements were performed with threshold detectors, sandwitch resonance foils and gold foils for neutrons and thermoluminescence detectors for gamma rays. The results were compared with calculations by ANISN and TWOTRAN-II. C/E values are not satisfactory on the centerline of the shield. As for the shapes of the distribution of reaction rates in the shields, however, good agreements are obtained between the experiments and the calculations by TWOTRAN.

44708 (BNWL-tr—317) **One year of Phenix operation.** Conte, F. Translated from *Ann. Nucl. Energy;* **3**: 85-94(1976). 34p. Dep. NTIS (US Sales Only), PC A03/MF A01.

The report describes the chronological order of operations from the time that the Phenix Power Plant was first connected to the public supply grid on December 13, 1973. The end of tests prior to placement of the plant in service is described briefly. These tests were interrupted by periods for jobs which ended on July 14, 1974. From that date the operating level was appreciable, and the sequence of operations proceeded without major incident up to the present. This chronological description is accompanied by progress diagrams up to the end of March 1975, by production statistics, by the main operating characteristics under different conditions and by a summary of the incidents which occurred during operation. These factors lead to load and availability ratios of 76% and 81%, respectively, with an overall efficiency above 45%.

REGULATION AND LICENSING

44709 (NUREG—0386(Suppl.3)) **United States Nuclear Regulatory Commission Staff Practice and Procedure Digest. Supplement 3 to Digest No. 1.** (Nuclear Regulatory Commission, Washington, D.C. (USA). Office of the Executive Legal Director). Apr 1978. 18p. NTIS $4.00.

Includes Commission, Appeal Board, and Licensing Board decisions for October—December 1977.

This is the third of a series of Supplements to the NRC Practice and Procedure Digest. This Supplement updates the Digest by including pertinent Commission, Appeal Board, and Licensing Board rulings for the period October 1, 1977 to December 31, 1977. The Supplement also adds several new topics. The Supplement is structured in the same manner as the Digest. For the convenience of users, the text of the Supplement is preceded by an index which lists the Digest topic headings which are supplemented. In using the main Digest, this index to Supplement 3 as well as those to Supplements 1 and 2 should be consulted to assure that the Digest discussion has not been superseded or updated by information in the Supplements. Supplement 3 is intended for use as a "pocket part". It should be inserted after Supplements 1 and 2, following the main Digest. Notice is hereby given that all disclaimers with respect to content, accuracy and completeness of information, express or implied warranties, and use of or reliance upon information presented, set forth in regard to the Digest itself, are equally applicable to this Supplement.

44710 (NUREG—0397) **Revised inspection program for nuclear power plants.** (Nuclear Regulatory Commission, Washington, D.C. (USA). Office of Inspection and Enforcement). Jan 1978. 28p. NTIS $4.50.

The United States Nuclear Regulatory Commission (NRC) regulates nuclear power plants to assure adequate protection of the public and the environment from the dangers associated with nuclear

materials. NRC fulfills this responsibility through comprehensive safety reviews of nuclear facilities, licensing of organizations that use nuclear materials, and continuing inspection. The NRC inspection program is currently conducted from the five regional offices in or near Philadelphia, Atlanta, Chicago, Dallas and San Francisco. Inspectors travel from the regional offices to nuclear power plants in various phases of construction, test and operation in order to conduct inspections. However, in June 1977 the Commission approved a revision to the inspection program that will include stationing inspectors at selected plants under construction and at all plants in operation. In addition, the revised program provides for appraising the performance of licensees on a national basis and involves more direct measurement and observation by NRC inspectors of work and tests in progress. The program also includes enhanced career management consisting of improved training and career development for inspectors and other professionals. The report was requested in the Conference Report on the NRC Authorization for Appropriations for Fiscal Year 1978. The report provides a discussion of the basis for both the current and revised inspection programs, describes these programs, and shows how the NRC inspection force will be trained and utilized. In addition, the report includes a discussion of the actions that will be taken to assure the objectivity of inspectors.

44711 (NUREG—0447) **Antitrust review of nuclear power plants. Recent developments.** Delaney, J.B.; Honeycutt, T.C.; Messier, M. (Nuclear Regulatory Commission, Washington, D.C. (USA). Office of Nuclear Reactor Regulation). Apr 1978. 59p. NTIS $5.25.

This report updates and augments an earlier report that cataloged antitrust license conditions resulting from the Nuclear Regulatory Commission's (NRC's) antitrust review process mandated by the 1970 antitrust amendments from December 1970 to April 1976. An overview of the NRC's antitrust review process relevant to applications for construction permits and operating licenses is presented. Information on the antitrust reviews completed from May 1976 to February 1978 is also given. This information includes the identity of applicants, utility system and unit sizes, the geographic location of the applicant, and a summary of any antitrust license conditions.

44712 (NUREG/CR—0022) **Improving regulatory effectiveness in Federal/State siting actions. Need for power: determinants in the state decisionmaking processes.** Noble, J.B.; Hemphill, J.B. (Center for Natural Areas, Washington, D.C. (USA)). Mar 1978. 73p. NTIS $5.25.

The Department of Energy's Nuclear Siting and Licensing Act of 1978 (S.2775; H.R.11704) proposes Federal/State coordination in need for facility decisionmaking for nuclear power stations. A prior study by the Nuclear Regulatory Commission's Office of State Programs, "Improving Regulatory Effectiveness in Federal/State Siting Actions", NUREG-0195, May 1977, considered the concept of need for power/facility. The present study expands the inquiry into need for power/facility by examining the decisionmaking criteria utilized by forty-four States in making a determination of need for power/facility. Specific criteria are identified along with the number of States which make those criteria a primary consideration or a secondary consideration in determining need for facility. Individual profiles of the studied States' decisionmaking criteria are provided. In addition, the study examines the different organizational and functional patterns found in the States' regulatory processes to certificate power stations. The coordination or lack of coordination of the issuance of associated environmental permits required for power stations is outlined for each State. Information concerning States' rate treatment of expenses associated with the construction and operation of a power station is provided. The relationship between the need for power decisionmaking process and the ratemaking process is explored.

44713 (NUREG/PRDI—78/6) **Power Reactor Docket Information.** (Nuclear Regulatory Commission, Washington, D.C. (USA)). Jun 1978. 55p. TIC $4.50.

Citations and subject indexing to the documentation associated with civilian nuclear power plants are presented. This material is that which is submitted to the U.S. Nuclear Regulatory Commission in support of applications for construction and operating licenses. Citations are listed by Docket number in accession number sequence. The Table of Contents is arranged by both Docket number and by nuclear power plant name. (DG)

44714 Measurement of liquid radioactive materials for monitoring radioactive emissions. Draft. Koeln, Germany, F.R.; Heymanns (Oct 1977). 45p. (In German).

This draft regulation applies to measuring equipment for liquid radioactive materials for the monitoring of the radioactive discharges from stationary nuclear power plants with LWR and HTR reactors. Demands made on the measuring procedure, methods of concentration determination, balancing, indication of limiting values, and inspections are described. The draft regulation deals with: 1) Monitoring liquid radioactive discharges: Water and similar systems; radionuclides and their detection limits, radioactively contaminated water (waste water); secondary cooling water; power house cooling water; primary cooling water; flooding water; 2) Layout of the measuring and sampling equipment and demands made on continuous and discontinuous measuring equipment; demands made on discontinuous α and β measuring equipment; 3) Maintenance and repair work; inspections; repair of defects; 4) Demands made on documentation; reports to authorities; 5) Supplement: List of general and reference regulations.

REACTOR DOCKETS

44715 (DOCKET-50309—855) **Maine Yankee Atomic Power Plant. IE circular No. 78-06: potential common mode flooding of ECCS equipment rooms at BWR facilities.** (Maine Yankee Atomic Power Co., Westboro, Mass. (USA)). 31 May 1978. vp.

ECONOMICS

44716 (AECL—5800, pp 97-111) **Future developments in nuclear power.** Phillips, G.J. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Apr 1977.

In Nuclear power: the Canadian issues. A submission from Atomic Energy of Canada Limited to The Royal Commission on Electric Power Planning in response to The Commission's Issue Paper No. 1 'Nuclear power in Ontario'.

CANDU design can evolve to minimize energy cost and extend fuel resources by 1) going to larger unit sizes; 2) accommodation of new nuclear fuels; 3) new coolant concepts like organic liquids and boiling light water. Reactors have many appropriate applications as direct heat sources, especially if only part of the output is extracted as heat. Many energy storage schemes are in use or under investigation all over the world. Use of off-peak electricity to electrolytically produce hydrogen looks particularly interesting for Canadian requirements. Use of accelerators and nuclear reactions as neutron sources is especially attractive considering the near-breeder characteristics of the CANDU reactor. Fusion is seen as a not especially cheap or clean energy source with formidible technical barriers.

44717 (CONF-760688—, pp 12-30) **Comparative electrical generation costs.** Anderson, D.E. (Ontario Hydro). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 5: nuclear energy and the industry (part 2).

Ontario Hydro's peak capacity and fuel consumption for 1976 are given. Effects of inflation are analyzed. The generating capacity expansion program is outlined. Capital costs, unit energy costs, and life cycle costs are analyzed for hydraulic, fossil-fueled, and nuclear generation plant.

44718 (CONF-760688—, pp 100-111) **IAEA nuclear power forecast for developing countries.** Skjoeldebrand, R.; Roberts, J.T. (International Atomic Energy Agency). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 4: nuclear energy and the industry (part 1).

Previous nuclear power studies and forecasts which the IAEA has made for developing countries are reviewed and a new forecast made based on 1975 data. Downward revision of nuclear power growth is startling, in view of a quadrupling of oil prices. Market studies indicate a demand for reactors smaller than 600 MWe.

44719 Hidden costs of nuclear energy. Sweet, C. *New Phytol.;* No. 1, 17-19(1978).

A lynch pin of the pro-nuclear argument is that atomic energy provides cheap electricity. Many are sceptical of such claims, realising that a lot of figures have been omitted from the accounting - the cost of R and D, of dismantling the obsolete stations and of waste management - but having no access to all the figures, such scepticism has remained little more than a hunch. Using conventional economic accounting it is shown that nuclear power must be considerably more costly than has ever been admitted by any of the authorities. The CEGB claims that reprocessing amounts to no more than 8 per cent of the total costs of nuclear generated electricity. According to the present author the costs are 20 per cent - and that 20 per cent is of a much higher figure.

44720 Decisions of the way to the future energy supply - a fatal question for society. Schulten, R. (Technische Hochschule Aachen (Germany, F.R.)). *Universitas;* **32**: No. 3, 245-256(Mar 1977). (In German).

Having stated that growth of energy consumption will still be necessary in the near future, the author outlines possible future technologies on the basis of nuclear power (for example, combined heat and power generation, coal gasification, water splitting).

44721 Fundamental studies of system investigations in nuclear energetics. Dollezhal', N.A.; Melent'ev, L.A. *Vestn. Akad. Nauk SSSR;* No. 11, 51-61(Nov 1976). (In Russian).

The problems of system analysis in nuclear energetics are considered. This analysis makes it possible to select the optimum long-term program for the development of nuclear engineering. The system analysis techniques, which represent the nuclear energetics as integral nuclear energetic system (NES), are developed. On the basis of the techniques a complex is worked out of mathematical models and a cycle of calculations is carried out. It is shown that an important role in the long-term NES development program is played by fast-neutron reactors. The economic efficiency of nuclear fuel is estimated. The rate of development of nuclear energetics and the conditions for increasing the efficiency of its structure are determined.

44722 Different reactor types and the Belgian option. Cote, W.; Lienard, J. *Rev. Phys. Appl.;* **32**: No. 9, 124-131(1976). (In French).

After a brief description of the main families of reactors: heavy water, H.T.G.R., light water and fast breeder reactors,the authors comment unfavourably on the conclusions of the working group 3 of the "sages report", concerning the Belgian choice of PWR until 1985. The same reflections are held on the engagements of Belgium into the breeder reactor project as an alternative after 1985. Considerations are given on the plutonium technology.

CONSTRUCTION AND OPERATION

44723 Economic evaluation of bids for nuclear power plants. A guidebook. Vienna; IAEA (1976). 183p.

The purpose of the guidebook is to assist an organisation responsible for a nuclear power project in evaluating and establishing an economic order of merit among competing bids. An approximate overall time schedule for a first nuclear power plant project is provided. A schematic outline of technical bid evaluation is given. The basic procedure of economic bid evaluation is outlined, e.g. evaluation of the present worth of all cost items of plant capital investment, of the nuclear cycle, of O and M costs (operation and maintenance costs), and of economic corrections. All these cost items are evaluated for the economic life of the plant and corrected for escalation where applicable.

FUEL CYCLE

44724 (ORNL/TM—6331) **Economics and utilization of thorium in nuclear reactors.** (Resource Planning Associates, Inc., Cambridge, Mass. (USA)). May 1978. Contract W-7405-ENG-26. 198p. Dep. NTIS, PC A09/MF A01.

Information on thorium utilization in power reactors is presented concerning the potential demand for nuclear power, the potential supply for nuclear power, economic performance of thorium under different recycle policies, ease of commercialization of the economically preferred cases, policy options to overcome institutional barriers, and policy options to overcome technological and regulatory barriers.

44725 (R—2239-DOE) **Nuclear reactor spent fuel valuation: procedure, applications, and analysis.** Solomon, K.A. (RAND Corp., Santa Monica, Calif. (USA)). Feb 1978. Contract EX-76-C-01-2337. 53p. Dep. NTIS, PC A04/MF A01.

A preliminary approach that values nuclear reactor generated spent fuel is developed and applied in this report. There is no intent to assess the merits of reprocessing and recycling but rather to outline a procedure that may provide a basis for international negotiations on nation-to-nation spent fuel transfer. The valuation procedure described estimates the net present discounted value (PDV) of the benefit incurred when the reprocessed plutonium and uranium contained in the spent fuel are recycled, less the PDV of the stream of costs associated with transporting, storing, and reprocessing the spent fuel and fabricating, storing, and safeguarding the new mixed oxide fuel (MOX). The parameters that affect the net PDV most strongly are the discount rate, yellowcake prices, reprocessing costs, timing of recycle or disposal, and, to a lesser extent, enrichment costs.

44726 International nuclear fuel cycle evaluation program (INFCE). Loosch, R. *Atomwirtsch., Atomtech.;* **23**: No. 1, 33-36(Jan 1978). (In German).

From Meeting on the international nuclear fuel cycle evaluation program (INFCE); Washington, DC, USA (19 - 21 Oct 1977).

The conference called by the U.S. Government in Washington from October 19-21, 1977 to organize an international evaluation of the nuclear fuel cycle (INFCE) was attended by almost 40 countries and four international organizations. The two-year program decided at the meeting is intended to minimize the proliferation hazard of nuclear weapons without impairing the peaceful uses of nuclear power. Although INFCE itself will only carry out analytical studies of a technical nature and nor envolve any international agreements, the unbiased character of the work could help to remove two major drawbacks associated with the present export guidelines of the 'London Club': the exclusiveness of those guidelines and the absence of a guarantee that their acceptance will ensure supply.

44727 Regional nuclear fuel cycle centres. Basic studies. 1977 report of the IAEA study project. Vol. 2. Vienna; IAEA (1977). 306p.

The chapters of this document have been catalogued separately.

The complete reports of the basic studies pertinent to the evaluation of the international Regional Fuel Cycle Centre (RFCC), and a detailed description of the analytical methodology developed during the study are presented.

PROCESS HEAT REACTORS

REFER ALSO TO CITATION(S) 44057

44728 Use of nuclear energy for district heating. Margen, P. (Aktiebolaget Atomenergi, Studsvik (Sweden)). *Prog. Nucl. Energy;* 2: No. 1, 1-28(1978).

So far only one reactor - the Agesta reactor, south of Stockholm has been used to supply a sizeable district heating scheme. For 10 years this pilot scheme delivered 10 MW of electricity to the grid and initially 50 later 70 MW of heat to the suburb 'Farsta' of Stockholm, with a very good reliability record. As yet it has had no successors anywhere in the world. Agesta was of course too small to give good economics, but it gave valuable experience. As the citizens of Farsta had become accustomed to the smokeless nuclear heat, there were many protests from the public when Agesta was shut down to allow the nuclear effort in Sweden to be concentrated on bigger units. Since the oil crisis, nuclear district heating schemes have, however, been studied with increasing effort in a number of countries as one of the possible ways of achieving lower heat costs, conserving the limited oil and natural gas resources, and reducing air pollution. In this article the author describes the basis for assessing the performance and economics of such schemes. To do this it has been necessary to treat not merely the nuclear plants but also the entire system of transport distribution and storage of heat. Many of the numerical examples in this area have been taken from the Swedish scene with which the author is best acquainted but also many comments on conditions in other countries are included. Also the institutional obstacles which often stand in the way of a wider use -and the manner in which they are starting to be tackled by several countries - are discussed. The subject is treated in a manner which it is hoped will be useful also to those without previous experience of district heating.

NUCLEAR REACTOR TECHNOLOGY

44729 (CONF-760688—) **Nuclear energy and society. Volume 4. Nuclear energy and the industry (part 1).** (Canadian Nuclear Association, Toronto, Ontario). [nd]. vp. Canadian Nuclear Association, Toronto, Ontario.

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

Separate abstracts have been prepared for the individual papers included.

THEORY AND CALCULATION

44730 (AECL—5305) **CONIFERS: a neutronics code for reactors with channels.** Davis, R.S. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Apr 1977. 116p. Dep. NTIS (US Sales Only), PC A06/MF A01.

CONIFERS is a neutronics code for nuclear reactors whose fuel is in channels that are separated from each other by several neutron mean-free-path lengths of moderator. It can treat accurately situations in which the usual homogenized-cell diffusion equation becomes inaccurate, but is more economical than other advanced methods such as response-matrix and source-sink formalisms. CONIFERS uses exact solutions of the neutron diffusion equation within each cell. It allows for the breakdown of this equation near a channel by means of data that almost any cell code can supply. It uses the

results of these cell analyses in a reactor equations set that is as readily solvable as the familiar finite-difference equations set. CONIFERS can model almost any configuration of channels and other structures in two or three dimensions. It can use any number of energy groups and any reactivity scales, including scales based on control operations. It is also flexible from a programming point of view, and has convenient input and output provisions.

44731 (CONF-780401—7) **Neutronics analysis of the low proliferating gas core reactor.** Wessol, D.E.; Olson, W.O.; Close, J.A. (Idaho National Engineering Lab., Idaho Falls (USA)). 1978. Contract EY-76-C-06-1570. 14p. Dep. NTIS, PC A02/MF A01.

From Topical meeting on advances in reactor physics; Gatlinburg, TN, USA (9 Apr 1978).

The recent interest in the development of proliferation resistant fuel cycles has prompted an investigation of the gas core reactor concept. The gas core reactor consists of a cavity containing fissile material in a gaseous state surrounded by an external reflector-moderator. A fuel-coolant mixture of UF_6 and Helium is considered in most gas-core reactor conceptual designs. Currently this concept is one of several being considered for the Non-proliferation Alternate Systems Assessment Program (NASAP). Since the gas core reactor is seen to present special difficulties with respect to reactor physics analysis, the INEL gas core critical benchmark offered an ideal test of reactor physics methods. The experiment was analyzed with Monte Carlo, S/sub n/ transport theory and diffusion theory methods. Diffusion theory methods are shown to be inadequate for the gas core concept. More importantly, it is shown that a high order scattering approximation is necessary to accurately predict experimental results, regardless of method. Convergence was found to be particularly sensitive to the selection of acceleration strategies and parameters.

44732 (CONF-780403—3) **Multilevel crossing rates for automated signal classification.** Mitchell, R.J.; Gonzalez, R.C. (Tennessee Univ., Knoxville (USA). Dept. of Electrical Engineering; Oak Ridge National Lab., Tenn. (USA)). 1978. Contract W-7405-ENG-26. 7p. Dep. NTIS, PC A02/MF A01.

From IEEE international conference on acoustics, speech and signal processing; Tulsa, OK, USA (10 Apr 1978).

An investigation was made of multilevel crossing rates as a means of time series analysis of random signals. Pattern recognition techniques based on the Mahalanobis distance were implemented as a means of evaluating the discriminating power of level crossings. Measurement of multilevel crossing rates was found to be an easily implementable means for detection of changes in general frequency content. Level crossing analysis was also shown to be applicable for the study of conductivity measurements of two-phase flow of air and water, where knowledge of the relationship between amplitude and frequency was beneficial in characterizing the process.

44733 (IAE—2526) **Data preparation for calculations with the Monte-Carlo method on the base of the 26-group constant system.** Timofeev, I.G.; Frank-Kamenetskii, A.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1975. 23p. (In Russian). Dep. NTIS (US Sales Only), PC A02/MF A01.

A set of programs is discussed for preparation of data to be used in reactor calculations on the basis of the Monte-Carlo technique and a constant system of 26 groups. To describe interaction of neutrons with a substance, a purely group approach is employed. Source data for the set of programs under discussion are the group macroscopic cross-sections computed with the ARAMACO program. Simulating collision subprogram is applied, written in the FORTRAN language.

44734 (LA—7271-PR) **Transport and reactor theory. Progress report, January 1—March 31, 1978.** Miller, W.F. Jr.; Dudziak, D.J.; O'Dell, R.D.; Gomez, M.F. (comps.). (Los Alamos Scientific Lab., N.Mex. (USA)). May 1978. Contract W-7405-ENG-36. 36p. Dep. NTIS, PC A03/MF A01.

Progress is summarized in the areas of reactor physics, radiation shielding and fusion reactor nucleonics, and supporting research and reactor safety. The work in all areas involved principally transport code development.

44735 Higher order prompt-jump approximation in reactor kinetics. Blenski, T.; Gadomski, A.; Mika, J. (Inst. of Nuclear Research, Swierk, Poland). *Nucl. Sci. Eng.;* **66**: No. 3, 277-283(Jun 1978).

The singular perturbation method is applied to the stiff system of differential equations representing the one-point reactor kinetics model and is shown to be a higher order generalization of the prompt-jump approximation. The numerical tests show that a sufficient accuracy can be achieved even in low-order approximations for reasonable reactivity inputs for both fast and thermal reactors.

44736 Analysis of the eigenvalue equations in k, λ, γ, and α applied to some fast- and thermal-neutron systems. Velarde, G.; Ahnert, C.; Aragones, J.M. (Junta de Energia Nuclear, Madrid). *Nucl. Sci. Eng.;* **66**: No. 3, 284-294(Jun 1978).

The time-dependent Boltzmann equation for neutron transport is transformed into eigenvalue equations in k, lambda, γ, and α, whose general properties are stated as hypotheses. Numerical solutions are obtained with the discrete-ordinates code DTF, where a direct lambda eigenvalue calculation has been added. Eigenvalues and eigenfunctions are analyzed for idealized fast and thermal systems in both bare and reflected configurations. The differences found in these idealized cases provide some useful bases for estimating the behavior of the different eigenvalue solutions in specific applications.

44737 Application of sensitivity and uncertainty methodology to fast reactor integral experiment analysis. Weisbin, C.R.; Oblow, E.M.; Marable, J.H.; Peelle, R.W.; Lucius, J.L. (Oak Ridge National Lab., TN). *Nucl. Sci. Eng.;* **66**: No. 3, 307-333(Jun 1978).

The first results are presented of a comprehensive application of the sensitivity theory developed for the FORSS code system to the analysis of fast reactor integral experiments. A variety of assemblies and performance parameters were studied to determine the nuclear data sensitivity as a function of nuclide, reaction type, and energy. Comprehensive libraries of energy-dependent sensitivity coefficients were developed. Uncertainties induced by nuclear data were quantified using preliminary energy-dependent relative covariance matrices evaluated with ENDF B-IV cross sections and processed for $^{238}U(n,f)$, $^{238}U(n,\gamma)$, $^{239}Pu(n,\gamma)$, and $^{239}Pu(anti\ \nu)$. Calculational results, cross-section covariances, and integral results and their covariances were used in a consistent fashion to improve uncertainty estimates . A first attempt was made to quantify specifications for new cross-section measurements required to satisfy specific design goals at minimum experimental cost. An analysis of several critical experiments indicated that design accuracy goals of 0.5% in k and 2% in the central ^{238}U capture: ^{239}Pu fission ratio ($^{28}c/^{49}f$) ratio in mixed oxide liquid-metal fast breeder reactor cores are unlikely to be attained in the near future. this result assumes the nuclear data are based only on microscopic measurements, and the current cross-section measurement program is not changed dramatically. Current estimates are 2.3% in k and 7.3% in central reaction ratio using only differential covariance information. Using the measurements in ZPR-6/7 for k and central $^{28}c/^{49}f$ in a cross-section adjustment scheme with assigned uncorrelated standard deviations of 1 and 2%, respectively, standard deviations of the same parameters were computed to be 0.7 and 1.8%. Results of integral experiments, therefore, are needed to improve uncertainty estimates.

44738 Prediction of fission product and actinide levels in irradiated fuel and cladding. Burstall, R.F.; Thornton, D.E.J. (United Kingdom Atomic Energy Authority, Risley, Eng.). pp 416-424 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The production of radioactive isotopes and their subsequent decay is of crucial importance in the nuclear industry, dominating the shield design of chemical reprocessing plants, transport flasks and waste disposal facilities which account for a large part of the capital investment in a nuclear programme. The isotopes are also important in studies of reactor shielding. The computation of the level and behavior of such nuclides has been practiced for many years in countries with nuclear industries, with ever-increasing sophistication in methods of calculation and in improving the accuracy of the basic nuclide data. Calculation is usually made for three groups of nuclides, the actinides or transuranics, the fission products, and nuclides present in the cladding. The currently accepted computer code within the UKAEA for such calculations is FISPIN. This code calculates activities for all the above groups either separately or in combination. As well as individual nuclide concentrations and activities integral information is produced. The paper describes the methods of calculation. The code has been compared with other codes which have a similar function, and it is concluded that the only significant differences are those associated with data. A number of different data sets, to a large degree independent, have been compared using the code, and the paper describes some of the results obtained.

44739 Simple albedo method for calculating effects of single-legged ducts. Celnik, J. (Burns and Roe, Inc., Paramus, NJ). pp 688-693 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

A simple albedo formulation has been incorporated into a computer program for the analysis of gamma ray transmission through straight ducts. The program treats sources and receiver locations located arbitrarily with respect to the duct. It is shown that the program is accurate for source and receiver points located on the

duct axis, and underestimates the dose rate for receiver locations near the exit but below the axis. The effect of pipe inside an air duct is demonstrated. The code is also used to calculate the scatter dose rate contribution from selected duct surface areas.

44740 Exponential supplementary equations for S/sub N/ methods: the two-dimensional case. Barbucci, P.; Di Pasquantonio, F. (ENEL, Milan). pp 711-718 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

This paper refers to the implementation of the exponential supplementary equations on the DOT-III and DOT 3.5 two-dimensional S/sub N/ codes. Extensive numerical experiments for neutron deep penetration problems showed that the exponential method increases the convergence rate of the iterative procedure and substantially reduces the C.P.U. times with respect to the DOT diamond scheme with step fixup. Moreover some time savings have been found also with respect to DOT 3.5 weighted difference scheme. For its own structure, the exponential method always gives positive angular fluxes without any fixup techniques. For some gamma ray deep penetration problems, there is a convergence missing. At present we are working to explain and overcome these difficulties.

44741 Intercomparison of Monte Carlo calculations and measurements of the neutron and gamma-ray-streaming in multi bent ducts. Vogt, H.G. (Technical Univ. of Hannover). pp 857-864 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The neutron and gamma-ray attenuation in multilegged air-filled ducts has been calculated with the analog Monte Carlo code SAM-CE. Calculations of the neutron transmission have been made furthermore with the albedo Monte Carlo code AMC. The calculated attenuation curves are compared with experimental data, being available for the investigated duct systems. Results are given for rectangular duct geometries with cross-sectional areas varying from 25 x 25 cm^2 to 230 x 230 cm^2 and legs with center line lengths between 75 cm and 12 m. On the basis of the good agreement between calculations and measurements parametric studies have been performed with the SAM-CE code for different material compositions of the duct walls. The neutron attenuation proves to be rather insensitive to variations of the concrete density or material composition but responds to changes in the water content. A remarkable influence of the wall material is found on the gamma-ray attenuation. The effect of a lead and iron lining covering all inside surfaces of the ducts is investigated in particular.

COMPONENTS AND ACCESSORIES

REFER ALSO TO CITATION(S) 45261

44742 (IAEA—18; CONF-751268—, pp 259-261) **Nuclear installation inspectorate presentation.** Adams, N.J.I. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

Nuclear Installation Inspectorate (NII) is the licensing authority for the construction and operation of nuclear power generating systems for, or in commercial operation in the United Kingdom. NII's conclusions and recommendations on the applicability of fracture mechanics are given.

44743 (IAEA—18; CONF-751268—, pp 461-463) **Conclusions and recommendations.** 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

It is considered that for thick section low alloy steel pressure vessel applications, Appendix A of the ASME Code provides the best currently available approach. In some special and specific situations, an extension to the Appendix A approach is desirable to cover the local conditions at a nozzle corner. For thinner section applications such as piping, some extension from the Appendix A method is considered necessary.

44744 (IAEA—18; CONF-751268—, pp 211-216) **Influence of the stress state on the fracture toughness.** Aurich, D. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

Application of fracture mechanics on the failure analysis of pressure vessels is discussed. Particular attention is paid to analysis of stress states in specimens.

44745 (IAEA—18; CONF-751268—, pp 227-241) **Effects of reactor vessel fatigue loading cycles on crack growth.** Bamford, W.H. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

Studies of crack growth characteristics of reactor pressure vessel steels are reviewed. Experimental facilities at Westinghouse used for testing programs on this subject are described.

44746 (IAEA—18; CONF-751268—, pp 385-405) **Brittleness. Presupposition (criteria) for reactor vessel brittle fracture.** Bazant, E. (Hochtemperatur-Reaktorbau G.m.b.H., Mannheim (Germany, F.R.)). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

Brittleness, the subject of this report, is the prerequisite for brittle fracture of a reactor vessel (RV). Brittleness is not actually a material property; rather it is a tendency towards fracture without showing any plastic deformation. There are two kinds of brittleness: one is dependent on the material, the other one depends on the load conditions. The report begins with a description of the brittle/ductile temperature concept, a method to determine the transition temperature of the impact test. The section "fracture mechanics" concludes that brittle fracture of crack-free material is not applicable to the RV. The fracture analysis diagram, however, is a means to describe brittle fracture as a problem of crack growth and to specify a relation between such variables as crack size, stress, temperature, and type of failure. Following an outline of the various brittle fracture test methods, Porse's fracture criterion is applied to include brittleness into the RV design. The report finally gives an account of the fracture criteria relevant for RV operation.

44747 (IAEA—18; CONF-751268—, pp 383-384) **Final comments of the U.S. delegation concerning ASME code Section XI, Appendix A.** Bush, S.H. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

44748 (IAEA—18; CONF-751268—, pp 23-27) **Methods employed by UKAEA in the evaluation of flaws.** Cowan, A. (Risley Engineering and Materials Lab., UKAEA, Risley). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

The methods applied by UKAEA in the evaluation of the flaws in pressure vessels and containment structure of nuclear reactors are presented. The methods are based on Linear Elastic Mechanics and General Yielding Fracture Mechanics. The procedures which are used and highlights the problem which has been encountered are outlined.

44749 (IAEA—18; CONF-751268—, pp 185-205) **Effect of defects on structural failure: A two-criteria approach.** Dowling, A.R.; Townley, C.H.A. (Central Electricity Generating Board, Berkeley (UK). Berkeley Nuclear Labs.). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975).

In Fracture mechanics applications: implications of detected flaws.

The two-criteria approach to the study of defects in structures assumes that failure occurs when the applied load reaches the lower of either a load to cause brittle failure in accordance with the theories of linear elastic fracture mechanics or a collapse load dependent on the ultimate stress of the material and the structural geometry. This simple approach is described and compared with previously published experimental results for various geometries and materials. The simplicity of this method of defect analysis lies in the fact that each criterion is sufficiently well understood to permit scaling and geometry changes to be accommodated readily. It becomes apparent that a sizeable transition region exists between the two criteria but this can be described in an expression relating the criteria. This expression adequately predicts the behaviour of

cracked structures of both simple and complex geometry. A design curve for defect assessment is proposed for which it is unnecessary to consider the transition region.

44750 (IAEA—18; CONF-751268—, pp 87-100) **Changes in fatigue crack shape during growth.** Iida, K.; Kawahara, M. (Department of Naval Architecture University of Tokyo, Hongo, Bunkyo-ku, Japan). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

Some recent studies in Japan on fatigue crack growth from a surface flaw from a viewpoint of crack shape are reviewed. Experimental data are summarized with special attention to the variation at depth-to-length ratio of a propagating fatigue crack.

44751 (IAEA—18; CONF-751268—, pp 377-381) **Written comments concerning the different topics of the meeting.** Kotilainen, H. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

Comments of the representation of Finland to the specialists' meeting are given on the following subjects: programs of linear elastic fracture and elastic plastic fracture mechanics in Finland, flaw indication characterization, evaluation standards, definition of material properties, acceptability criteria.

44752 (IAEA—18; CONF-751268—, pp 101-102) **Some comments on the variations of crack growth along the crack front at nozzle corners.** Latzko, D.G.H. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

44753 (IAEA—18; CONF-751268—, pp 249-257) **Fracture safety of reactor vessels in the presence of nozzle corner cracks: Netherlands research programs.** Latzko, D.G.H. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

This note briefly outlines two current Netherlands research programs concerning the fracture safety of pressure vessels in the presence of nozzle corner cracks. These programs are funded by the Netherlands government, the total budget being about 1,6M$ (an extension is under negotiation). They comprise investigations based on LEFM-concepts and EPFM-concepts (mainly the J-integral) respectively. Brief mention is also made of additional work concerning the influence of an initial overload on subsequent fatigue growth of cracks emanating from stress concentrations. This work is carried out in a separate program.

44754 (IAEA—18; CONF-751268—, pp 407-460) **Development of the tangent modulus method of elastic-plastic fracture analysis.** Merkle, J.G. (Oak Ridge National Lab., Tenn. (USA)). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

The method of elastic-plastic fracture analysis to be discussed here is based on Neuber's Equation for estimating the actual stress and strain concentration factors of a sharp notch in the elastic-plastic range. The innovation in the analysis is that the basic equation is written in terms of the increments of stress and strain instead of the total stresses and strains, because the former approach is known to provide a more accurate description of elastic-plastic behaviour. The use of Neuber's Equation as a starting point allows the effects of overall geometry on notch tip behaviour to be accounted for by the elastically calculated fracture mechanics shape factor. The result is a simple differential equation that can be directly integrated, providing that the effective tangent modulus in the net section can be estimated as a function of the nominal strain. For this purpose, the average tangent modulus across the net section is used as the effective tangent modulus, and the method of analysis is called the Tangent Modulus Method. The fracture criterion used in the Tangent Modulus Method is directly related to the value of Ksub(Ic), and therefore to the results of both standard and small specimen testing. Because the relation between the average tangent modulus across the net section and the nominal strain enters the analysis, predicted fracture strains are functions of both the shape of the stress-strain curve and the nominal strain gradient. These effects have been observed experimentally, but they are not predicted by other methods of fracture analysis presently proposed for structural components. The Tangent Modulus Method has been successfully applied to the analysis of both large and small surface cracked tensile bars, and a series of model pressure vessels containing surface cracks. Differences in transverse restraint have been observed between these two types of specimens, and these differences can be accounted for in the analysis.

44755 (IAEA—18; CONF-751268—, pp 11-21) **KWU proposal for the national practice in the assessment of integrity against fracture for nuclear components.** Schmitt, W. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

The safety against brittle fracture is investigated for all specified loading cases such as the hydro pressure test, operation, heat up and cool down, faulted and emergency conditions. Different calculation methods for these loading conditions are applied.

44756 (IAEA—18; CONF-751268—, pp 103-117) **Fracture mechanics and welding.** Soete, W. (Ghent Rijksuniversiteit (Belgium)). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

The problems of fructure mechanics and welding applicable to structural steels are defined. Some recommendations for experimental research, for application to welds, are given.

44757 (IAEA—18; CONF-751268—, pp 81-85) **Behaviour of Cracks and its analysis using fracture mechanics.** Sommer, E. (Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Freiburg im Breisgau (Germany, F.R.). Inst. fuer Festkoerpermechanik). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

The analysis and investigation of typical non-artificial crack configuration in structures or structural members under load are presented. The extension of part-through cracks and interaction at multiple cracks are discussed.

44758 (IAEA—18; CONF-751268—, pp 207-209) **C.O.D. Measuring technique on CT-specimens as applied in the Sulzer Laboratories.** Varga, T. 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

The clip-in-gauge method is used to furnish the basis for fracture mechanics and evaluation of pressure vessel safety.

44759 (IAEA—18; CONF-751268—, pp 267-270) **Non-destructive testing, fracture mechanics and defect tolerances.** Varga, T. (Sulzer Bros. Ltd., Winterthur (Switzerland)). 1976.

From Meeting on fracture mechanics applications implications of detected flaws; Winterthur, Switzerland (3 Dec 1975). In Fracture mechanics applications: implications of detected flaws.

Defects were found in increasing numbers with further refinements of non-destructive testing techniques. On the other hand, codes and quality standards generally do not tolerate any flat, crack-like discontinuity. Possible solution of this problem is recommended.

44760 (ORNL/Sub—2913/7) **End effects on elbows subjected to moment loadings.** Rodabaugh, E.C.; Iskander, S.K.; Moore, S.E. (Battelle Columbus Labs., Ohio (USA)). Mar 1978. Contract W-7405-ENG-26. 73p. Dep. NTIS, PC A04/MF A01.

End effects on elbows subjected to moment loading are investigated using the finite element program EPACA. Relatively simple but more accurate (than present Code) equations are developed and recommendation for an alternative Code method using these equations is presented. Data from EPACA on stresses at welds (elbow-to-pipe juncture) are presented. A simple equation is given for estimating the maximum stresses at the welds.

44761 (ORNL/TM—6191/V1) **Monitoring of prestressed concrete pressure vessels. 1. An overview of concrete embedment strain instrumentation and calibration test results for selected concrete embedment strain meters.** Naus, D.J.; Hurtt, C.C. (Oak Ridge National Lab., Tenn. (USA)). 8 May 1978. Contract W-7405-ENG-26. 119p. Dep. NTIS, PC A06/MF A01.

The report presents results of calibration tests on strain meters. The approach was divided into two phases: (1) an overview of meter performance criteria for PCPV applications and techniques for strain measurements in concrete and (2) procurement of commercially available gages and their evaluation to assess the reliability of manufacturer-supplied calibration factors. Calibration test results for

gages embedded in 15.2-cm-diam by 54-cm cylindrical concrete specimens indicated that calibration factors should be determined (verified) by embedding samples of the gages in test specimens fabricated using a representative mix and that further research should be conducted on other measurement techniques based on inductance, capacitance, semiconductors, and fluidic principles.

44762 Handling apparatus for a nuclear reactor fuel assembly. Shallenberger, J.M.; Hornak, L.P.; Desmarchais, W.E. (to Westinghouse Electric Corp.). US Patent 4,081,086. 28 Mar 1978. Filed date 6 Feb 1974. 6p.

An apparatus is disclosed for handling radioactive fuel assembly during transfer operations. The radioactive fuel assembly is drawn up into a shielding sleeve which substantially reduces the level of radioactivity immediately surrounding the sleeve thereby permitting direct access by operating personnel. The lifting assembly which draws the fuel assembly up within the shielding sleeve is mounted to and forms an integral part of the handling apparatus. The shielding sleeve accompanies the fuel assembly during all of the transfer operations.

44763 Electrical wire for use in nuclear generating stations. Robertson, A.B. (to Allied Chemical Corp.). US Patent 4,079,191. 14 Mar 1978. Filed date 7 Jul 1975. 8p.

Electrical wire and cable suitable for use in nuclear generating stations, having at least one electrical conductor, a micaceous insulating layer surrounding the conductor and a layer of fluoropolymer insulation surrounding the micaceous layer are described.

44764 Manufacturing of a double-wall reactor insert by using special equipment for monitoring the strains and stresses caused by welding. Sachse, K.; Springer, W. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Zentralabteilung Allgemeine Technologie). *Schweissen Schneiden;* **29**: No. 9, 371-374(Sep 1977). (In German).

Set-up, manufacture, and testing of an experimental device (double-wall pressure vessel) for the irradiation of a test fuel element are described. It consisted of NiCr22Mo9Nb resp. X 6 CrNi 18 11 and was inert-gas tungsten arc welded. Special requirements resulted, above all, from the small tolerable dimensional variations. They could only be met by stress and strain measurements as well as systematic equalizing during the welding process.

44765 Optimisation of shielding for direct-cycle steam turbine plant. Martin, A. (Associated Nuclear Services, Epsom, Eng.); Firmin, G.H.; Eaton, J.R.P. pp 694-702 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The paper describes the application of a point-kernel air-scatter code SHINE, to the design and optimization of the upper shielding for a direct-cycle steam turbine plant. The code uses a single-scattering treatment and makes allowance for air attenuation of the primary and scattered radiation. The contribution from multiple scattering is approximated by a buildup treatment. Geometrically, the program simulates a point source at any position within a rectangular enclosure with opaque walls and an open top. The results of comparisons between SHINE and a Monte Carlo code, W-MORSE, are presented both for point mono-energetic sources in simple geometries and for typical steam pipes with wall attenuation. The use of SHINE as a optimization tool is illustrated by a comparison of the cost-effectiveness of various shield configurations in reducing the dose rate of the site boundary due to skyshine.

44766 Removal diffusion theory for calculating the effectiveness of neutron and gamma-ray shields for nuclear reactors and chemical plants. Richardson, B.L.; Burstall, R.F. (United Kingdom Atomic Energy Authority, Risley, Eng.). pp 703-710 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The method most widely used for rapid estimates of shield penetration in the United Kingdom has been removal-diffusion theory. It has been found to provide adequate accuracy for most design purposes, and is sufficiently economical in computer time to allow relatively unrestricted use. The algorithm is available in one, two or three dimensions, and codes are available in any of these forms within a modular scheme, which allows linking to data preparation and editing routines. The paper gives brief descriptions of the methods used, and of the facilities available. The approximations inherent in the methods are discussed, with results to indicate the best use of the methods.

44767 Coarse mesh algorithm to solve neutron transport equation in thick shields. Vaidyanathan, R. (Reactor Research Centre, Kalpakkam, India). pp 754-761 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Spatial interpolation of collision source is of central importance in determining the accuracy of the discrete integral transport methods. Two algorithms have been developed in this paper, to characterize the variation of the source within a space-mesh, and determine the solution. The first one consists in representing the source shape, by a simple function, determined through geometric considerations. This is, in general, discontinuous at the mesh boundaries. The angular flux is then obtained analytically. In the second algorithm, the spatial moments of the angular flux and hence those of the source, are computed recursively. The source is then represented as a function of undertermined constants, which are evaluated by preserving a finite number of moments. Again the angular flux is obtained by analytic integration. Arbitrary degree of anisotropy in scattering is allowed, in these methods. Both the procedures, used appropriately serve to give accurate solution, with significant reduction in computer time and memory. These techniques have been built in the code system APARNA. Fast neutron transport through a ten-foot-block of sodium, and a thick sodium-steel system has been studied with our method. It was found that accuracy of 1% in the spatial distribution and tramsitted flux can be achieved with a mesh width of a few tens of cms, in both cases.

44768 Fresh concrete control in situ of biological shields of nuclear reactors. Hoenig, A. (Brno Technical Univ.). pp 905-912 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The biological shields of nuclear reactors are mostly ordinary or heavy concrete walls which require special attention as far as their density is concerned. Their post-testing by ultrasonics has shown itself rather doubtful, especially as it is practically impossible to repair insufficiently dense localities. The costs associated with injection operations are not proportional to the improvement obtained. Continuous radiometric control of the density of fresh concrete makes it possible to repair insufficiently dense localities at once. The Radiometric Gauge developed at the Brno Technical University for continuous operational control and its application in the construction of nuclear power plants in Czechoslovakia and in Hungary is described.

44769 Secondary gamma radiation study in reactor shielding. Abagjan, A.A.; Gasnikov, N.K.; Germogenova, T.A.; Dubinin, A.A.; Zhuravlyov, V.I.; Kolevatov, Yu.I.; Kurachenko, Yu.A.; Mashkovitch, V.P.; Sakharov, V.K. pp 913-921 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Experimental and computational results of differential and integral characteristics of a secondary gamma radiation field for different materials (water, iron, lead) are presented; all data are given in absolute values. Experiments have been carried out using facilities with disk and plane monodirectional neutron sources of the reactor. Computations have been made on the PO3-V program. The paper presents the analysis of the data obtained. The experimental results can be applied to make corrections for different computational methods and constants of interaction of radiation with the material used in the calculations.

FUEL ELEMENTS

44770 (AECL—5400) **In-reactor measurement of fuel-to-sheath heat transfer coefficients between UO_2 and stainless steel.** Campbell, F.R.; Bourque, L.R.; DesHaies, R.; Sills, H.; Notley, M.J.F. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). May 1977. 79p. Dep. NTIS (US Sales Only), PC A05/MF A01.

An experimental technique has been developed to measure the fuel-to-sheath heat transfer coefficient in operating UO_2 fuel elements in a more direct manner than previously possible. During in-reactor operation, the thermal response of the fuel (measured by thermocouples placed near the outer surface of the UO_2 pellets) and the dimensional response of the sheathing (measured by attached strain gauges) were monitored while varying either the element internal gas pressure or the element power. Detailed quantitative

analysis yields both the solid and fluid components of fuel-to-sheath heat transfer as a function of gap width, gas pressure and composition, and interfacial pressure.

44771 (AECL—5850) **Review of session V of the ANS topical meeting, St. Charles, Il., USA, May 1977: "Mechanisms for pellet cladding interactions".** Wood, J.C. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Jul 1977. 19p. (CONF-7706133—1). Dep. NTIS (US Sales Only), PC A03/MF A01.

From IAEA specialists meeting; Vienna, Austria (27 Jun 1977).

All seven authors were agreed that power ramping of UO_2-Zircaloy fuel pins could cause clad defects that were not solely mechanical but of the stress corrosion cracking or liquid metal embrittlement type. Very strong circumstantial evidence for stress corrosion cracking was presented by relating the results of laboratory experiments and theoretical analyses with the behaviour of fuel in-reactor and its physical and chemical characteristics observed during post-irradiation examination. The most likely corrodant species to be responsible for defects are iodine, cadmium or cadmium dissolved in cesium.

44772 (AERE-TP—714) **Plutonium redistribution in mixed-oxide $(U,Pu)O_2$ nuclear fuel elements.** Clement, C.F.; Finnis, M.W. (UKAEA Research Group, Harwell. Atomic Energy Research Establishment). Aug 1977. 25p. Dep. NTIS (US Sales Only), PC A02/MF A01.

Relatively simple analytic expressions are found for actinide redistribution by lenticular pore motion and by solid state thermal diffusion. Properties of the former, which is based on a previously determined expression for the pore velocity, v, are investigated, and calculations show that pore motion cannot significantly redistribute plutonium unless v is greatly reduced by a mechanism such as fission gas pickup. The expression for redistribution from thermal diffusion is fitted to data for two fuel pins. Together with previous fits, the results for one pin are consistent with the use of a Pu-U diffusivity with an activation energy of 105 +- 10 kcal $mole^{-1}$. The failure to fit the data on the other pin points to the need for a reduction in uncertainties in specified temperatures. Redistribution by vapour transport in cracks is found to be unimportant for observed crack densities.

CONTROL SYSTEMS

REFER ALSO TO CITATION(S) 45819

44773 (EPRI-NP—783) **Performance measurement system for training simulators. Interim report.** Bockhold, G. Jr.; Roth, D.R. (General Physics Corp., Columbia, Md. (USA)). May 1978. 102p. Dep. NTIS, PC A06/MF A01.

In the first project phase, the project team has designed, installed, and test run on the Browns Ferry nuclear power plant training simulator a performance measurement system capable of automatic recording of statistical information on operator actions and plant response. Key plant variables and operator actions were monitored and analyzed by the simulator computer for a selected set of four operating and casualty drills. The project has the following objectives: (1) To provide an empirical data base for statistical analysis of operator reliability and for allocation of safety and control functions between operators and automated controls; (2) To develop a method for evaluation of the effectiveness of control room designs and operating procedures; and (3) To develop a system for scoring aspects of operator performance to assist in training evaluations and to support operator selection research. The performance measurement system has shown potential for meeting the research objectives. However, the cost of training simulator time is high; to keep research program costs reasonable, the measurement system is being designed to be an integral part of operator training programs. In the pilot implementation, participating instructors judged the measurement system to be a valuable and objective extension of their abilities to monitor trainee performance.

44774 **Control for nuclear thermionic power source.** Fletcher, J.C.; Sawyer, C.D. US Patent 4,085,004. 18 Apr 1978. Filed date 21 Nov 1975. 10p.

A control for a power source is described which includes nuclear fuel interspersed with thermionic converters, including a power regulator that maintains a substantially constant output voltage to a variable load, and a control circuit that drives a neutron flux regulator in accordance with the current supplied to the power regulator and the neutron flux density in the region of the converters. The control circuit generates a control signal which is the difference between the neutron flux density and a linear fucntion of the current, and which drives the neutron regulator in a direction to decrease or increase the neutron flux according to the polarity of the control signal.

44775 **Method and apparatus for monitoring the axial power distribution within the core of a nuclear reactor, exterior of the reactor.** Graham, K.F.; Gopal, R. (to Westinghouse Electric Corp.). US Patent 4,079,236. 14 Mar 1978. Filed date 5 Mar 1976. 14p.

A method and apparatus for establishing the axial flux distribution of a reactor core from monitored responses obtained exterior of the reactor is described. The monitored responses are obtained from at least three axially spaced flux responsive detectors that are positioned within proximity of the periphery of the reactor core. The detectors provide corresponding electrical outputs representative of the flux monitored. The axial height of the core is figuratively divided at a plurality of space coordinates sufficient to provide reconstruction in point representation of the relative flux shape along the core axis. The relative value of flux at each of the spaced coordinates is then established from a sum of the electrical outputs of the detectors, respectively, algebraically modified by a corresponding preestablished constant.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 44622, 44811, 45319, 45359

RADIOACTIVE EFFLUENTS

REFER ALSO TO CITATION(S) 44301

CHEMICAL AND THERMAL EFFLUENTS

44776 (UCID—17744-78-2) **Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report.** Harrison, F.L. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 30 Apr 1978. Contract W-7405-ENG-48. 17p. Dep. NTIS, PC A02/MF A01.

The objectives of this research project are threefold: to obtain data on the behavior of potentially toxic substances introduced into surface waters from nuclear power plants; to determine the magnitude of the impact these substances on representative and economically important aquatic species; and to develop models with which to predict the partitioning of these substances among the abiotic aquatic compartments. To fulfill these objectives in our investigation of copper, we are determining copper partitioning in aquatic systems, evaluating the toxicity of copper to representative aquatic organisms, and developing a mathematical model to predict copper partitioning.

RESEARCH, TEST, AND EXPERIMENTAL REACTORS

REFER ALSO TO CITATION(S) 44803

44777 (AECL—5399) **Performance of highly rated UO_2 fuel in the WR-1 organic-cooled reactor.** Schankula, M.H.; Hastings, I.J. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jul 1977. 43p. Dep. NTIS (US Sales Only), PC A03/MF A01.

UO_2 fuel with cold-worked Zr-2.5wt%Nb sheathing was irradiated in the WR-1 organic-cooled reactor to burnups of 135-154 MWh/kgU at a time-averaged linear power of 60-63 kW/m. Elements with 0.38 and 0.69 mm thick sheathing showed maximum diametral increases averaging 3.7 and 1.7% respectively at pellet mid-planes. Reduced fuel/sheath heat transfer resulting from a difference between internal gas pressure and coolant pressure produced high operating temperatures, and there was evidence of central melting in some elements. Fission gas releases were 30-60%. In the heat affected zone adjacent to brazed appendages, the diametral increases were lower, averaging 0.9 and 0.5% for 0.38 and 0.69 mm thick sheathing respectively. Heat treatment during the brazing process produced a local improvement in sheath creep strength. Highly rated oxide fuel irradiated in organic coolant will require sheathing with improved high temperature creep properties; heat-treated Zr-2.5 wt% Nb may provide this improvement.

44778 (ANL—77-46) **First mechanized in-service inspection of EBR-II steam generator.** Longua, K.J.; Whitham, G.K.; Reimann, K.J. (Argonne National Lab., Ill. (USA)). Sep 1977. Contract W-31-109-ENG-38. 39p. AT.

A mechanized ultrasonic test system was developed and built at Southwest Research Institute (SwRI) to conduct the first in-service inspection of the 2¼ Cr-1 Mo steel duplex tubing in the EBR-II steam-generator system. This inspection required tube in-

spection from the bore side, complete volumetric examination, wall-thickness measurement, and evaluation of the braze condition. The test equipment was thoroughly checked and routinely calibrated, using a standard containing artificial flaws. Artificial flaws as small as 1.6 mm long by 0.25 mm deep were readily detected. Forty-eight of 73 tubes were inspected, and 15 of them were rescanned for verification of indications. Calculations showed that the largest indication, 5 mm long by 0.25 mm deep, would not grow to sufficient size before the next scheduled inspection to cause concern. The second indication was classified as a small dent. Before this inspection, an exploratory manual ultrasonic testing examination was conducted on EV-702, but inherent limitations made this test unsuitable for definition of the duplex-tube condition. This test was useful, however, in specifying the requirements for the mechanized ultrasonic test system. Finally, parallel laboratory studies were conducted to examine effects of flaw size and orientation on ultrasonic indications. While the results of these studies were not directly used for the in-service inspection, they do form a basis for (1) understanding the ultrasonic test signals in duplex 2¼ Cr-1 Mo steel tubes and (2) possible future refinements of the mechanized ultrasonic test system built by SwRI.

44779 (EUR—5456) **Prototype experiment of an irradiation facility for large HTR fuel specimens in the HFR Petten. Project E 91 - 0.** Conrad, R. (Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center). Jan 1977. 86p. Dep. NTIS (US Sales Only), PC A05/MF A01.

A prototype irradiation facility for the in-pile examination of full-size fuel compacts or other larger HTR fuel specimens by the vented operation principle has been tested in the HFR Petten during about 239 full power days, in which the in-pile as well as the out-pile equipment demonstrated a very good reliability and a safe operation. The specified irradiation conditions could be maintained throughout the testing period. Visual inspection of the rig components and also the fissile specimens after dismantling showed good conditions of all parts. The fissile specimens achieved a maximum fast neutron fluence of up to $5.86 \times 10^{21} cm^{-2}$(E0.1MeV) and a maximum burn-up of up to 8% FIMA at a maximum fission rate of about 2.4×10^{14} fissions per sec. The irradiation temperature was in the range of 1050°C.

44780 (HEDL-SA—1393) **Biases for current FFTF calculational methods.** Ombrellaro, P.A.; Bennett, R.A.; Daughtry, J.W.; Dobbin, K.D.; Harris, R.A.; Nelson, J.V.; Peterson, R.E.; Rothrock, R.B. (Hanford Engineering Development Lab., Richland, Wash. (USA)). 1978. Contract EY-76-C-14-2170. 9p. (CONF-780401—9). Dep. NTIS, PC A02/MF A01.

From Topical meeting on advances in reactor physics; Gatlinburg, TN, USA (9 Apr 1978).

Uncertainties in nuclear data and approximate calculational methods used in safety design, and operational support of a reactor yield biased as well as uncertain results. Experimentally based biases for use in Fast Flux Test Facility (FFTF) core calculations have been evaluated and are presented together with a description of calculational methods. Experimental data for these evaluations were obtained from an Engineering Mockup Critical (EMC) of the FFTF core built at the Argonne National Laboratory (ANL). The experiments were conceived and planned by the Hanford Engineering Development Laboratory (HEDL) in cooperation with the Westinghouse Advanced Reactors Division (WARD) and ANL personnel, and carried out by the ANL staff. All experiments were designed specifically to provide data for evaluation of current FFTF core calculational methods. These comprehensive experiments were designed to allow simultaneous evaluations of biases and uncertainties in calculated reactivities, fuel sub-assembly and material reactivity worths, small sample worths, absorber rod worths, spatial fission rate distributions, power tilting effects and spatial neutron spectra. Modified source multiplication and reactivity anomaly methods have also been evaluated. Uncertainties in the biases have been established and are sufficiently small to attain a high degree of confidence in the design, safety and operational aspects of the FFTF core.

44781 (HEDL-TI—75002-9) **FFTF emergency plan, FSAR amendment 9.** (Hanford Engineering Development Lab., Richland, Wash. (USA)). 10 Apr 1978. Contract EY-76-C-14-2170. 147p. AT.

The emergency plan for the FFTF reactor is presented.

44782 (LTR—11-20(Rev.B.)) **Fatigue life of LOFT Class I pipe welds.** Murdock, S.M. (Idaho National Engineering Lab., Idaho Falls (USA)). 4 May 1978. Contract EY-76-C-07-1570. 44p. (R—3542). Dep. NTIS, PC A03/MF A01.

This report provides updated calculated LOCE lifetimes of welds in designated LOFT Class 1 piping systems. For each weld, lifetime is defined as the greatest number of cycles of the governing transient such that cumulative usage factor does not exceed 1.0. Results are presented in tabular form. For parts of the pressurizer relief system, the number of relief cycles rather than LOCE cycles govern and are so shown.

44783 (LTR—1144-36) **LOFT pressurizer surge and spray line piping thermal analysis, Class I review.** Kinnaman, T.L.; Chapman, R.L. (Idaho National Engineering Lab., Idaho Falls (USA)). 31 Mar 1978. Contract EY-76-C-07-1570. 20p. (RE-A—77-137). Dep. NTIS, PC A02/MF A01.

Previous thermal analyses of the LOFT pressurizer surge and spray line piping were reviewed to see that they meet the requirements of ASME Code, Class I piping specification (ANC-60139), and the LOFT pressurizer specification (ANC-60044).

44784 (SAND—77-1737) **Physics analysis of an SFT fuel pin experiment in the ACPR.** Marshall, A.C. (Sandia Labs., Albuquerque, N.Mex. (USA)). Oct 1977. Contract EY-76-C-04-0789. 34p. Dep. NTIS, PC A03/MF A01.

This report describes a physics analysis of potential fuel pins for Argonne National Laboratory's planned Safety Test Facility (STF) reactor, under test conditions in the Sandia Annular Core Pulsed Reactor (ACPR). A physics analysis was required to select the pin design, loading and test conditions which would produce temperatures and temperature gradients that are expected to occur during pulsed operation of the Argonne STF reactor. The physics analysis used a one-dimensional transport theory computer code. Calculational results provided temperature gradients and maximum fuel pin temperatures as a function of uranium loading, matrix composition, pin diameter, pulse size and experiment configuration. The calculated temperatures and temperature gradients across the pins were found to be in good agreement with measured temperatures and temperature gradients.

44785 (TREE—1259) **Fission product and reactor dosimetry studies at Coupled Fast Reactivity Measurements Facility.** Harker, Y.D.; Rogers, J.W.; Millsap, D.A. (Idaho National Engineering Lab., Idaho Falls (USA)). Mar 1978. Contract EY-76-C-07-1570. 50p. Dep. NTIS, PC A03/MF A01.

The Coupled Fast Reactivity Measurements Facility (CFRMF) plays a special role in the Idaho National Engineering Laboratory's general program to provide basic technological data for the development of fission reactors as safe and economical sources of energy for domestic use. Because of its unique features the CFRMF has been used to provide key integral data in the areas of fast neutron fission product capture effects and fast reactor dosimetry development. This report has been prepared to provide in one document a specification of the CFRMF and the results of measurements performed in it. The data are expected to be used in the evaluation and testing of neutron cross section files pertaining to fission products, dosimetry materials, and other special applications.

44786 (ZPR-TM—312) **Comparative safety physics parameters in the advanced fuels critical assemblies.** Bhattacharyya, S.K.; Wade, D.C.; Bucher, R.G.; Robinson, W.R.; Schaefer, R.W. (Argonne National Lab., Ill. (USA)). 12 Apr 1978. Contract W-31-109-ENG-38. 17p. (CONF-780401—8). Dep. NTIS, PC A02/MF A01.

From Topical meeting on advances in reactor physics; Gatlinburg, TN, USA (9 Apr 1978).

The interest in the use of advanced fuels (carbide and advanced oxide) in LMFBR's stems from the projected improvement in breeding properties over conventional mixed-oxide fuels. This improvement in breeding is a consequence of the higher fuel volume fractions achievable in the advanced fuels designs and the concomitant harder neutron spectrum and lower enrichment. The impact of these changes, not only on the breeding properties but also on the safety physics parameters (^{238}U Doppler effect, sodium void effect, and ^{10}B control rod worth), has a strong bearing on whether these fuels are ultimately adopted. A set of key integral physics parameters were measured in a series of advanced fuels critical assemblies constructed on ZPR-9 to assess the relative safety and breeding properties of candidate advanced fuels. The experimental results confirmed the projected improvement in the breeding properties in advanced fuels cores relative to current oxide LMFBR cores, and revealed that the accompanying changes in the safety-related physics parameters were generally large and of unfavorable sign. Specifically, it was found that relative to the ZPR-6, assembly 7 benchmark "current mixed-oxide" values for normalized parameters, the central ^{238}U Doppler worth decreased by 20-40%, the central ^{10}B worth decreased by 10 to 20% and the central (non-leakage component) sodium void reactivity worth increased by 30 to 40% in the advanced fuels compositions. It was shown that the C/E values on safety parameters in the advanced fuels compositions are of comparable size to those in current oxide assemblies.

44787 **Shield design of a 100 MW(Th) Research Reactor.** Chamany, B.F. (Bhabha Atomic Research Centre, Bombay). pp 563-569 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The paper discusses the problems encountered in the Shield Design for a heavy water moderated and heavy water cooled 100 MW(Th) Research Reactor. The concrete biological shield is penetrated by several beam holes and through-tubes and calculations of neutron and gamma streaming through annular gaps of shield plugs and beam holes have many problems, the most uncertain being the evaluation of incident as well as leakage current into the beam holes. Photo-neutron generated in D_2O play a very critical role in the shield design. The N^{16} activity calculation in the moderator-coolant circuit is highly uncertain due to errors in the calculation of neutron spectrum above the threshold in the coolant moderator. Evaluation of photo-neutron source in D_2O due to N^{16} decay gammas is also uncertain due to the complicated geometry involved for the piping and header layout. The presence of photo-neutron makes it mandatory to have neutron shield all around D_2O circuit in addition to shielding for N^{16} decay gammas. Design of refuelling machines become involved due to photo-neutron produced by fission product gammas above photo-neutron threshold.

44788 Analysis of external exposures of the personnel operating the RA reactor at Vinca for 1967—1976 period. Ninkovic, M.M. (Boris Kidric Inst. of Nuclear Sciences, Vinca, Yugoslavia). pp 785-794 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The paper first gives a survey of the characteristic operations performed on the Vinca reactor RA in which the most of the personnel was irradiated. Following is a schematic diagram of the irradiations as presented for the period 1967 to 1976, in which the reactor was in continual operation. The surveys are given for each year separately, while the irradiated personnel are grouped in several characteristic exposure ranges. In this analysis special emphasis is given to a survey of irradiation of the personnel classified according to their profession, i.e. their post. This kind of analysis is indispensable in planning work, proper disposition of the personnel and undertaking special protective measures for reducing the exposure.

PLUTONIUM AND ISOTOPE PRODUCTION REACTORS

44789 (DUN-NUSAR—7824) **Fuel storage basin: criticality safety analysis report and technical basis.** Toffer, H. (United Nuclear Industries, Inc., Richland, Wash. (USA)). Dec 1971. Contract EY-76-C-06-1857. 79p. Dep. NTIS, PC A05/MF A01.

44790 (EUR—5369) **Handbook of materials testing reactors and ancillary hot laboratories in the European Community.** (Commission of the European Communities, Brussels (Belgium)). 1977. 234p. Dep. NTIS (US Sales Only), PC A11/MF A01.

The purpose of this Handbook is to make available to those interested in 'in-pile' irradiation experiments important data on Materials Testing Reactors in operation in the European Community. Only thermal reactors having a power output of more than 5 MW(th) are taken into consideration. In particular, detailed technical information is given on the experimental irradiation facilities of the reactors, their specialized irradiation devices (loops and instrumented capsules), and the associated hot cell facilities for post-irradiation examination of samples.

44791 (HW—53612(Rev.2)) **Technical criteria and bases: pressurized water-cooled, graphite moderated production reactor.** Shoemaker, R.H. (United Nuclear Industries, Inc., Richland, Wash. (USA)). 1 Feb 1961. Contract EY-76-C-06-1857. 101p. Dep. NTIS, PC A06/MF A01.

Portions of document are illegible.

A considerable amount of new information has been developed since the date of issuance of Revision 1 of the N-reactor technical criteria and bases. In addition, through mutual agreements of concerned parties, some features of the design scope have evolved in forms which would not be permitted by strict interpretations of the criteria and bases as they appear in Revision 1. Therefore, even though design scope was nearly complete in the latter part of 1960, it seemed advisable to review and revise the criteria and bases on the basis of our present assessment of technology. It is of interest to note that the results of his re-evaluation of technology have not contradicted the general direction taken in design scope, while they have provided valuable additional data to aid in the optimization of detail design.

PROPULSION REACTORS

44792 Mock-up experiment of radiation streaming through coolant pipe penetration. Tsubosaka, A. (Japan Nuclear Ship Development Agency, Tokyo); Miyakoshi, J.; Furuta, K. pp 849-856 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The pressure vessel of Mutsu is enclosed by a primary shield consisting of a laminated iron-water shield padded with lead (lower primary shield), atop which is placed concrete shields (middle and upper primary shield). Between the primary shield and the pressure vessel, there is an air gap through which coolant piping of 23.1 cm outside diameter padded with thermal insulation penetrates from the pressure vessel into and through the concrete shield. The radiation from the reactor core streams into the air gap, and then into the coolant pipe. A mock-up experiment to examine the radiation attenuation along the coolant pipe penetration through the pressure vessel wall and concrete shield was performed in the JRR-4 swimming pool reactor. The radiation was measured along the air gap and along the coolant pipe. Neutron measurements were made in terms of the reaction rates of $^{58}Ni(n,p)^{58}Co$ and $^{197}Au(n,\gamma)^{198}Au$. Lithium fluoride thermoluminescence dosimeters were also used to obtain neutron flux and gamma-ray dose rates. For analyzing the experimental results, radiation transport calculations were performed by means of the S/sub n/ code TWOTRAN. The annular air gap around the pressure vessel was treated in two dimensions. The resulting angular flux was adapted to calculations covering the coolant pipe, through conversion of coordinates accompanied to bootstrap treatment. Comparisons made between calculated results and experimental data indicated that the preset data and design method are adequate for estimating the radiation leakage with satisfactory accuracy.

REACTOR SAFETY

REFER ALSO TO CITATION(S) 44312

44793 (AECL—5694) **Nuclear power reactor safety.** Pon, G.A. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). Oct 1976. 10p. Dep. NTIS (US Sales Only), PC A02/MF A01.

This report is based on the Atomic Energy of Canada Limited submission to the Royal Commission on Electric Power Planning on the safety of CANDU reactors. It discusses normal operating conditions, postulated accident conditions, and safety systems. The release of radioactivity under normal and accident conditions is compared to the limits set by the Atomic Energy Control Regulations.

44794 (AECL—5800, pp 11-17) **Safety of CANDU reactors.** Snell, V.G. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). Apr 1977.

In Nuclear power: the Canadian issues. A submission from Atomic Energy of Canada Limited to The Royal Commission on Electric Power Planning in response to The Commission's Issue Paper No. 1 'Nuclear power in Ontario'.

The concepts of multi-level containment of radioactivity within the fuel, sheath, heat transport system, containment building, and exclusion zone are explained. The peculiar problems of designing to avoid very improbable accidents are outlined. Three levels of defense against accidents exist: good design and quality assurance; normal reactor process system response; and highly independent and redundant safety systems.

44795 (CONF-760688—, pp 1-19) **Designing to minimize radiation exposure.** Legg, G.G. (AECL-PP). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 8: scientific session - control of reactor radiation fields.

The radiation exposure received by the station staff must be considered during the design stage if CANDU stations are to achieve high capacity factor, high reliability and low maintenance and operational costs. On early CANDU stations, this exposure was higher than originally anticipated. Reviews to reduce exposure were started in 1969 and these have evolved into a formal program which defines specific objectives, classifies radiation levels, reviews designs and implements improvements where necessary. This paper outlines the program developed at AECL-PP for use during the design of CANDU stations.

44796 (CONF-760688—, pp 20-40) **Predicting radiation fields around reactor components.** Lister, D.H. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 8: scientific session - control of reactor radiation fields.

The mechanisms by which radiation fields grow around the out-core components of water-cooled reactors have been identified. Mathematical models of these mechanisms (which agree well with experimental data) are used to find ways of minimizing fields in CANDUs. Thus, the models indicate that: preconditioning is not important in feeder contamination; there is little incentive to specify low-cobalt steel for feeders; differences in the long term contamination of Inconel and Incoloy boiler tubes are negligible; high temperature filtration of the coolant reduces field growth.

44797 (CONF-760688—, pp 41-58) **Techniques to reduce radiation fields.** Montford, B. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 8: scientific session - control of reactor radiation fields.

Five lines of approach are being developed which in combination will greatly reduce radiation fields and therefore man-rem expenditures in our reactors. These are: 1. light water chemistry specifications to reduce corrosion to a minimum; 2. high flow purification systems to remove both dissolved and particulate corrosion products from the coolant; 3. large-scale hot filters to remove particles before they become neutron-activated; 4. selection and specification of materials to reduce radioactivity; 5. decontamination by both the Can-Decon process and the cycling techniques. The current status of each approach is reviewed. Further effort is required to reach the target dose of 0.3 man-rem/MW(e)-a.

44798 (CONF-771126—8) **Two-phase flow measurement by radioactive tracer techniques.** Kehler, P. (Argonne National Lab., Ill. (USA)). 1977. Contract W-31-109-ENG-38. 18p. Dep. NTIS, PC A02/MF A01.

From 5. water reactor safety research information meeting; Gaithersburg, MD, USA (7 Nov 1977).

The objective of this program is to develop instrumentation systems and techniques for radioactive tracer applications for one-component, two-phase flow measurements. The effort expended in this program is directed toward two goals: First, a technique is being developed for the measurement of the two-phase flow conditions during the experimental study of the phenomena in the upper reactor plenum during reflooding, to be performed with a full-scale, half vessel model of a PWR. Secondly, methods are being developed for the calibration of conventional two-phase flow measurement systems containing drag disks, turbines, and pressure sensors, by radioactive tracer techniques.

44799 (COO—2781-14) **Fuel—Coolant Thermal Interaction Project. Progress report No. 8.** Todreas, N.E. (Massachusetts Inst. of Tech., Cambridge (USA)). 1978. Contract EY-76-S-02-2781. 24p. Dep. NTIS, PC A02/MF A01.

Progress is reported in the areas of: (a) Analysis of the experimental results of a fundamental Taylor Instability Experiment; (b) Development of simple models for liquid entrainment and liquid-vapor heat transfer occurring in the transient expansion of a gaseous high pressure zone; and (c) Application of these models experiments to assess the model's adequacy.

44800 (COO—4261-4) **Growth of molten core debris pools in concrete. Progress report, March 1, 1977—November 30, 1977.** Abdel-Khalik, S.I. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Nov 1977. Contract EN-77-S-02-4261. 24p. Dep. NTIS, PC A02/MF A01.

Experiments have been conducted using a volumetrically-heated pool with noncondensable gas injection at the boundaries to simulate the heat transfer processes taking place in molten core debris/concrete systems. Measurements of the upward, downward, and sideward heat transfer rates have been made over wide ranges of internal Rayleigh number ($6.0 \times 10^5 < Ra < 2.7 \times 10^9$), superficial gas velocity ($0 < V/sub\ g/ < 2.5$ cm/min), and pool aspect ratio ($1.32 < W/L < 5.16$). Pools with either an isothermal solid upper boundary or a free surface have been examined. Detailed measurements of the temperature distribution within the pools have also been made. The results indicate that the downward heat transfer rates are significantly increased while the sideward heat transfer rates are slightly affected by gas injection. The heat transfer rates at the pool boundaries are sensitive to the upper surface boundary condition. Efforts are continuing on the second part of the present study where the phase-change and gas evolution processes are combined.

44801 (EPRI-NP—734(Pt.2)) **Study of Zircaloy-4: steam oxidation reaction kinetics. Final report.** Biederman, R.R.; Sisson, R.D. Jr.; Jones, J.K.; Dobson, W.G. (Worcester Polytechnic Inst., Mass. (USA). Higgins Lab.). Apr 1978. 109p. Dep. NTIS, MF A01.

Portions of document are illegible.

Experimental studies utilizing a "Gleeble" have been performed to evaluate the oxidation of reactor grade Zircaloy-4 tubing in steam throughout the 1200°F (649°C) to 1800°F (982°C) temperature range. Oxidation behavior in this temperature range was found to be substantially different from that predicted by either the Baker-Just equation or extrapolation of oxidation data from temperatures above 1800°F (982°C). Preoxidation of Zircaloy-4 below the α/β Zircaloy transformation was found to have a substantial effect on the rate of subsequent oxidation at temperatures above 1800°F (982°C) with this effect increasing as the preoxidation thickness increased. Furthermore, a preoxidation treatment prior to clad rupture has been observed to reduce the extent of swelling prior to clad rupture in internal pressurization studies. Evaluation of the load carrying ability of Zircaloy-4 for both as-received and 10 μm preoxidized cladding has been made under both internal pressurization and axial loading conditions. Results of these rupture studies agree well with reported data from several other research programs indicating that once the β phase of Zircaloy-4 begins to form, the load carrying ability of the cladding is rapidly reduced. Microstructural analysis and alumina marker studies have been used to develop a more complete understanding of the oxidation reaction of Zircaloy-4 in steam. These studies in combination with the low activation energy for oxygen diffusion through the oxide phase obtained from oxidation kinetics, strongly suggest a pore or surface diffusion mechanism for the oxidation of Zircaloy-4 in steam.

44802 (EPRI-NP—757) **SUNYAB/EPRI Combined Injection ECC Program. Interim report.** Chon, W.Y.; Liao, N.S.; Addabbo, C.; Thomsen, O.J. (State Univ. of New York, Buffalo (USA)). Apr 1978. 111p. Dep. NTIS, PC A06/MF A01.

The experimental results obtained in the first phase of SUNYAB/EPRI Combined Injection ECC Program are presented, to provide quick access to some interim findings obtained in this phase of the project. Following the description of the test facility and the test runs, the preliminary analyses of typical experimental results are described for both reflooding and for combined reflooding and top injection. Characteristic flow oscillations observed during the experiments are described.

44803 (EPRI-NP—800) **Comparison of experimental results with analytical predictions for LOFT nonnuclear tests with core simulator. Final report.** Davis, P.R.; Slater, C.E.; Wells, J.C.; Jensen, R.T.; Johnson, R.T. (Intermountain Technologies, Inc., Idaho Falls, Idaho (USA)). May 1978. 133p. Dep. NTIS, PC A07/MF A01.

This report presents the results of a comparison between analytical predictions of four non-nuclear LOFT tests and the subsequent test results. The test predictions were made with the RELAP thermal hydraulic computer code. The LOFT tests included L1-1, L1-2, L1-3A, and L1-4, all of which were non-nuclear blowdown tests conducted with a core simulator in the reactor vessel. The validity and usefulness (for comparison with analysis) of the experimental results as reported by EG and G Idaho are also reviewed.

44804 (EUR—5640) **Probabalistic analysis of the protection of a PWR against overpressure.** Coudert, C.; Amesz, J.; Volta, G. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). Mar 1977. 44p. (In French). Dep. NTIS (US Sales Only), PC A03/MF A01.

The problem of assessing the probability distribution of accidental transients in a nuclear plant is dealt with. The presented method consists of a combined probabilistic-deterministic approach. This approach is probabilistic in the sense that for each combination of system states a probability figure is determined by means of a fault-free analysis. It is deterministic in the sense that the corresponding sequence (e.g. magnitude of over-pressure) for each combination of states is computed by deterministic codes. An example is given in which the overpressure distribution of a pressurized water reactor is estimated.

44805 (GA-A—14600) **COCO: a computer program for seismic analysis of a single column of the HTGR core.** Rickard, N.D. (General Atomic Co., San Diego, Calif. (USA)). Feb 1978. Contract EY-76-C-03-0167-051. 81p. Dep. NTIS, PC A04/MF A01.

The document serves as a user's manual and theoretical manual for the COCO code. COCO is a nonlinear numerical integration program designed to analyze a single column of the HTGR core for seismic excitation. Output of the code includes dowel forces, collision forces, and a time history of the motion of the blocks.

44806 (GA-A—14699) **Containment Atmosphere Response (CAR) program status report.** Landoni, J.A. (General Atomic Co., San Diego, Calif. (USA)). Feb 1978. Contract EY-76-C-03-0167-065. 97p. Dep. NTIS, PC A05/MF A01.

The report contains a technical summary of the work performed on the chemical response of HTGR containment atmosphere during accidents such as core heat-up, steam ingress, and air ingress. Methods were developed and analytical models incorporated into existing and new computer programs. For the mixing and chemical behavior of combustible gases released into the containment atmosphere, a computer program based on the existing CNTB computer program for partial mixing in dry containment atmospheres at General Atomic (GA) was developed. An air ingress model was incorporated into the OXIDE-3 computer program to achieve coupling between the chemical reaction of air in the core and the containment response to the release of combustible gases from the prestressed concrete reactor vessel (PCRV). For the release of combustible particles into the containment atmosphere a new computer program (SILT) was developed for the prediction of the effects of combustion on containment integrity for a given concentration of carbon dust.

44807 (GA-A—14748) **Review of methods for the integration of reliability and design engineering.** Reilly, J.T. (General Atomic Co., San Diego, Calif. (USA)). Mar 1978. Contract EY-76-C-03-0167-023. 127p. Dep. NTIS, PC A07/MF A01.

A review of methods for the integration of reliability and design engineering was carried out to establish a reliability program philosophy, an initial set of methods, and procedures to be used by both the designer and reliability analyst. The report outlines a set of procedures which implements a philosophy that requires increased involvement by the designer in reliability analysis. Discussions of each method reviewed include examples of its application.

44808 (ORNL/NUREG—35) **Performance testing of single electrically heated fuel pin simulators for PWR LOCA experiments.** White, J.D. (Oak Ridge National Lab., Tenn. (USA)). May 1978. Contract W-7405-ENG-26. 63p. Dep. NTIS, PC A04/MF A01.

The Blowdown Heat Transfer Program (PWR-BDHT) uses electrically heated fuel pin simulators in 49-rod bundles in steady-state and transient heat transfer experiments. Prototypical fuel pin simulators representative of the first two bundles have been tested singly for thermal, mechanical, and electrical performance in blowdown experiments in a single-rod loop. Preliminary nondestructive tests were performed on all simulators prior to testing. As a result of the testing program, simulators for two 49-rod bundles were bought. Representative samples of these two groups were tested in the same fashion as were the prototypes. The electrical performance of each tested simulator was excellent. Measured parameters were resistance of the internal heater element and resistance of the BN and MgO insulating materials. The mechanical performances of the simulators were very good with respect to operability and survivability. A disappointing result, however, was that gaps appeared between the inner and outer parts of the dual-walled steel sheaths of bundle 1 prototypes and production heaters; gaps also appeared in bundle 2 heaters, but the magnitudes seemed much smaller. The thermal performances of the simulators were good with the exception of one aspect--repeatability of thermocouple output from one experiment to the next. The gaps in heater sheaths grew as a function of temperatures cycling with resultant increases in thermal resistances across the gaps. This effect diminished with the number of cycles. Other aspects of thermal performance were completely satisfactory: (1) reproducibility of time and location to transient CHF, (2) thermal time constants of thermocouples, (3) proper power profile, and (4) repeatability of heat flux profile.

44809 (ORNL/NUREG/TM—178) **Evaluation of the General Atomic codes TAP and RECA for HTGR accident analyses.** Ball, S.J.; Cleveland, J.C.; Sanders, J.P. (Oak Ridge National Lab., Tenn. (USA)). 4 Apr 1978. Contract W-7405-ENG-26. 39p. Dep. NTIS, PC A03/MF A01.

The General Atomic codes TAP (Transient Analysis Program) and RECA (Reactor Emergency Cooling Analysis) are evaluated with respect to their capability for predicting the dynamic behavior of high-temperature gas-cooled reactors (HTGRs) for postulated accident conditions. Several apparent modeling problems are noted, and the susceptibility of the codes to misuse and input errors is discussed. A critique of code verification plans is also included. The several cases where direct comparisons could be made between TAP/RECA calculations and those based on other independently developed codes indicated generally good agreement, thus contributing to the credibility of the codes.

44810 (SAND—78-0076) **Light water reactor safety research program. Quarterly report, July—September 1977.** (Sandia Labs., Albuquerque, N.Mex. (USA)). Apr 1978. Contract EY-76-C-04-0789. 32p. Dep. NTIS, PC A03/MF A01.

Progress is reported in studies on the following LWR core meltdown phenomena: (1) molten core-concrete interactions and (2) steam explosions.

44811 (SAND—78-0574C) **Investigations of the adequacy of the meteorological transport model developed for the reactor safety study.** Sprung, J.L.; Brown, W.D.; Church, H.W.; McGrath, P.E.; Ritchie, L.T.; Russo, A.J.; Steck, G.P.; Wayland, J.R.; Wall, I.B.; Blond, R.M. (Sandia Labs., Albuquerque, N.Mex. (USA); Nuclear Regulatory Commission, Washington, D.C. (USA)). 1978. Contract EY-76-C-04-0789. 13p. (CONF-780526—2). Dep. NTIS, PC A02/MF A01.

From ANS safety meeting; Newport Beach, CA, USA (7 May 1978).

Risk estimates for early fatalities, calculated using the Consequence Model (CRAC) of the Reactor Safety Study, are minimally sensitive to the specification of inversion layers, are essentially unaltered by the substitution of substantially more sophisticated plume rise or rainstorm/runoff models, and would be negligibly affected by the incorporation of wind shear. Site specific calculations for Indian Point and Zion suggest that, if all of the 68 sites examined by the Reactor Safety Study had nearby populations as large and as unfavorably situated as those of these two sites, the early fatality risk estimates of the Reactor Safety Study would be increased by at most a factor of approximately 10. Regression analyses show that reactor site wind and population distributions are not strongly correlated and that positive and negative correlations occur with nearly equal frequency, which suggests that their effects upon aggregate risk calculations would be largely self-cancelling. Results from risk calculations repeated using disparate meteorological files suggest that adequate risk estimates for early fatalities can be obtained for sites, for which wind speed, atmospheric stability, and precipitation data are unavailable, by substituting data from another site, which has similar topography and meteorology. Substitute meteorology calculations suggest that the composite populations used in the Reactor Safety Study caused the probabilities of early fatalities for low consequence events to be overestimated by about a factor of 3 and to be underestimated by about the same factor for higher consequence events.

44812 (SAND—78-0718) **Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples.** Thome, F.V. (Sandia Labs., Albuquerque, N.Mex. (USA)). Apr 1978. Contract EY-76-C-04-0789. 101p. Dep. NTIS, PC A06/MF A01.

This test was conducted to complement Test VIII which was a sequential test of cables, cable splices, and insulation samples. In this test, the generic LOCA environments (radiation, temperature, pressure, chemical spray) were simulated and simultaneously applied to the test items. There were no failures of any assemblies and all were able to function at rated current and voltage throughout the entire test. An additional parameter, dissipation factor, was monitored in this test and when used in conjunction with capacitance, provided a better indication of insulation degradation.

44813 (SAND—78-0742C) **Leakage effects on LMFBR cell liners.** Stone, C.M.; Gartling, D.K.; Nickell, R.E. (Sandia Labs., Albuquerque, N.Mex. (USA); Pacific Technology, Del Mar, Calif. (USA)). 1978. Contract EY-76-C-04-0789. 40p. (CONF-780609—4). Dep. NTIS, MF A01.

From ASME/CSME pressure vessels and piping conference; Montreal, Canada (25 Jun 1978).

Portions of document are illegible.

The thermostructural effects of a molten sodium spill onto a Liquid Metal Fast Breeder Reactor (LMFBR) cell liner are investigated utilizing a geometrically simple finite element model. The sodium spill is considered for various flow rate regimes. Because the actual characteristics of a spill are unknown, a parametric analysis was performed with the size of spill and heat transfer coefficient as variables.

44814 (TID—3525-R5-S11) **Reactor safety: a literature search.** Cunningham, D.C. (comp.). (Department of Energy, Oak Ridge, Tenn. (USA). Technical Information Center). May 1978. 94p. Dep. NTIS, PC A11/MF A01.

Included are 905 citations to report literature abstracted in Energy Research Abstracts during the period July 1976 through May 1977 on safety aspects of nuclear reactor design, siting, materials, engineered safeguards, and operating procedures. The reports cited concern the reliability of reactor systems and components, the consequences of potential accident conditions, and safety in power plant operations. Subject, author, corporate author, and report number-availability indexes are included.

44815 (UCID—17782) **Computer simulations of a 1/5-scale experiment of a Mark I boiler water reactor pressure-suppression system under hypothetical LOCA conditions.** Edwards, L.L. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 2 May 1978. Contract W-7405-ENG-48. 20p. Dep. NTIS, PC A02/MF A01.

The CHAMP computer code was employed to simulate a plane-geometry cross section of a Mark I boiling water reactor toroidal pressure suppression system air discharge experiment under hypothetical loss-of-coolant accident conditions. The experiments

were performed at the Lawrence Livermore Laboratory on a 1/5-scale model of the Peach Bottom Nuclear Power Plant.

44816 (UCRL—50016-78-1, pp 12-14) **Small-scale modeling of vertical loads for the boiling-water-reactor pressure-suppression system.** 31 Mar 1978.

In Mechanical Engineering Department quarterly report, January—March 1978.

In January 1976, the Lawrence Livermore Laboratory began a reactor-safety study for the Nuclear Regulatory Commission researching the pressure-suppression containment system of the Mark I class of boiling water reactors. In the pressure-suppression containment design of a light-water reactor, the success of the system design is based on the capability of a water heat sink to provide rapid and stable condensation of the released primary coolant during a hypothetical loss-of-coolant accident (LOCA). In such a hypothetical accident, escaping steam forces the air in the drywell to vent into the wetwell. Venting occurs below the pool surface through the open end of downcomers. Significant dynamic pool motion and loads in the wetwell result from the initial venting of the air. A one-fifth-scale three-dimensional pressure-suppression experimental facility was built at LLL and tests were performed to quantify the hydrodynamic phenomena and associated forces. The experimental facility was scaled from the Peachbottom Mark I Boiling Water Reactor. Prior to the one-fifth-scale tests, an inexpensive but broadly scoped series of small-scale table-top experiments were conducted to provide detailed phenomenological and theoretical understanding of the key features of the dynamic behavior of the pressure suppression system. The article reports the results of these studies, which were conducted to characterize the dynamic vertical load function resulting from downcomer clearing. The table-top experiments were successful in predicting the general characteristics of the vertical load function for the one-fifth-scale LLL experiment and will be useful for other large-scale experiments.

44817 (UCRL—52342) **Effective mass and damping of submerged structures.** Dong, R.G. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 1 Apr 1978. Contract W-7405-ENG-48. 76p. Dep. NTIS, PC A05/MF A01.

Various structures important for safety in nuclear power plants must remain functioning in the event of an earthquake or other dynamic phenomenon. Some of these important structures, such as spent-fuel storage racks, main pressure-relief valve lines, and internal structures in the reactor vessel, are submerged in water. Dynamic analysis must include the force and damping effects of water. This report provides a technical basis for evaluating the wide variety of modeling assumptions currently used in design analysis. Current design analysis techniques and information in the literature form the basis of our conclusions and recommendations. We surveyed 32 industrial firms and reviewed 49 technical references. We compare various theories with published experimental results wherever possible. Our findings generally pertain to idealized structures, such as single isolated members, arrays of members, and coaxial cylinders. We relate these findings to the actual reactor structures through observations and recommendations. Whenever possible we recommend a definite way to evaluate the effect of hydrodynamic forces on these structures.

44818 (UCRL—52435) **BWR pool dynamics in a loss of coolant accident. Calculation of the air-venting phase.** Glenn, L.A.; McMaster, W.H. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 9 Mar 1978. Contract W-7405-ENG-48. 18p. Dep. NTIS, PC A02/MF A01.

The authors calculated the air-venting phase of a loss of coolant accident (LOCA) in a BWR pool using both compressible and incompressible finite difference schemes, and compared the results with experiments made at the University of California, Los Angeles and the Massachusetts Institute of Technology. The incompressible approach was found to be the most effective, because of the very low flow Mach numbers involved. Theory and experiment were in good agreement.

44819 (WCAP—9183) **PWR FLECHT skewed profile low flooding rate test series evaluation report.** Lilly, G.P.; Yeh, H.C.; Dodge, C.E.; Wong, S. (Westinghouse Electric Corp., Pittsburgh, Pa. (USA)). Nov 1977. 334p. NTIS.

The FLECHT Low Flooding Rate Skewed Power shape tests is the second test series designed to expand the earlier FLECHT forced flooding rate data base for lower flooding rates. This report presents the evaluation, analysis, and model development efforts which have been performed on the skewed axial data. The overall objective of the FLECHT low flooding rate test program has been to obtain heat transfer data useful for calculating the reflooding behavior of a PWR core following a postulated loss-of-coolant accident. The behavior of the emergency core coolant (ECC) with respect to the mass stored and mass flow leaving the core during reflood is also needed for this purpose. The capability for meeting this latter need, has been made possible with the improved hardware and instrumentation of the cosine tests. The other main objective of the FLECHT low flooding rate test program is to provide valid data which can be used to verify/develop mechanistic reflood models.

44820 Characteristics and stability analyses of transient one-dimensional two-phase flow equations and their finite difference approximations. Lyczkowski, R.W. (Univ. of California, Livermore); Gidaspow, D.; Solbrig, C.W.; Hughes, E.D. *Nucl. Sci. Eng.;* **66**: No. 3, 378-396(Jun 1978).

Equation systems describing one-dimensional, transient, two-phase flow with separate continuity, momentum, and energy equations for each phase are classified by use of the method of characteristics. The main purpose of this paper is to study the mathematical nature of these equations, not their physics, although it is realized that these two problems are not entirely independent. Many of the equation systems possess complex-valued characteristics and hence, according to well-known mathematical theorems, are not well-posed as initial-value problems (IVPs). Real-valued characteristics are necessary but not sufficient to ensure well-posedness. In the absence of lower order source or sink terms, that can affect the well-posedness of IVPs, the complex characteristics associated with these two-phase flow equations imply unbounded exponential growth for disturbances of all wavelengths. Analytical and numerical examples show that the ill-posedness of IVPs for the two-phase flow partial differential equations that possess complex characteristics produce unstable numerical schemes. These unstable numerical schemes can produce apparently stable and even accurate results if the growth rate resulting from the complex characteristics remains small throughout the time span of the numerical experiment or if sufficient numerical damping is present for the increment size used. Other examples show that clearly nonphysical numerical instabilities resulting from the complex characteristics can be produced. These latter types of numerical instabilities are shown to be removed by the addition of physically motivated differential terms that eliminate the complex characteristics. These terms should not destroy long-wavelength physical instabilities that arise and that may sometimes be calculated approximately using ill-posed equation systems.

44821 Effects of internal circulation velocity and noncondensable gas on vapor condensation from a rising bubble. Oezisik, M.N. (North Carolina State Univ., Raleigh); Kress, T.S. *Nucl. Sci. Eng.;* **66**: No. 3, 397-405(Jun 1978).

The effects of internal circulation velocity and the presence of noncondensable gas on vapor removal rate by condensation from a rising large vapor-gas bubble produced in a hypothetical core disruptive accident are investigated by solving the resulting transient heat and mass transfer problem of turbulent flow. Sample calculations are performed for the condensation of UO_2 and sodium vapors containing noncondensable fission gases. The time-averaged condensation heat transfer coefficients are presented for the condensation of UO_2 and sodium vapors for different internal circulation velocities and the concentration of noncondensable gas.

44822 Fast power excursions in pebble-bed reactors: methods and results. Friedrich, K.; Infuehr, E.; Weicht, U. (Hochtemperatur-Reaktorbau, Mannheim, Ger.). *Nucl. Sci. Eng.;* **66**: No. 3, 415-421(Jun 1978).

The DYN and COSTANZA program systems for kinetics analysis are compared using sample calculations for pebble-bed high-temperature reactors. The DYN point kinetics method appears to be successful even where reactivity changes exceed β.

44823 Subatmospheric double containment system. Gans, D. Jr.; Noble, J.H. (to Stone and Webster Engineering Corp.). US Patent 4,081,323. 28 Mar 1978. Filed date 6 Mar 1975. 10p.

A reinforced concrete double wall nuclear containment structure with each wall including an essentially impervious membrane or liner and porous concrete filling the annulus between the two walls is described. The interior of the structure is maintained at subatmospheric pressure, and the annulus between the two walls is maintained at a subatmospheric pressure intermediate between that of the interior and the surrounding atmospheric pressure, during normal operation. In the event of an accident within the containment structure the interior pressure may exceed atmospheric pressure, but leakage from the interior to the annulus between the double walls will not result in the pressure of the annulus exceeding atmospheric pressure so that there is no net outleakage from the containment structure.

44824 Filtration of aerosols produced by a sodium fire. Duverger de Cuy, G.; Colome, J. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. de Surete Nucleaire). pp 533-544 of Seminar on high efficiency aerosol filtration in the nuclear industry. Luxembourg; Commission of the European Communities (Feb 1977). (In French)

From Seminar on high efficiency aerosol filtration in the nuclear industry; Aix-en-Provence, France (23 Nov 1976).

The containment system of the Super Phenix reactor takes account of the possibility of contaminated sodium fires, particularly in the vicinity of the fuel storage drum. It is thus necessary to contain the emitted radioactivity associated with a quantity of sodium aerosols of the order of some 10 g/m³. Investigations previously carried out had shown that the retention capacity of high-efficiency asbestos filters was clearly insufficient. A new research programme on the filtration of sodium aerosols has thus been worked out with the aim of: gaining a better understanding of the granulometry of the aerosols produced by the fire; checking the efficiency of the new glass-fibre media of which high-efficiency filters are composed; selecting a prefiltering system which, in conjunction with the high-efficiency filter, would ensure a suitable retention capacity for the whole unit. The following prefilters are under investigation: agglomerating cyclones; fabric prefilters (dense filter media - variable density filters - bag filters); water prefilters; sand prefilters. The experimental equipment on which this programme has been based is presented. Results have so far been obtained for agglomerating cyclones (recirculating loop with a cyclone of 95% efficiency), for a number of textile prefilters and for the retention capacity of high-efficiency filters.

44825 Grundremmingen nuclear power plant: The accident that came from the cold. *Energie;* **29**: No. 1, 4-5(Jan 1977). (In German).

The accident of January 13, 1977, is briefly described. The power plant was cut off from the network by an extreme temperature drop and high humidity, which caused a break in a number of porcelain insulators of two HV lines. The response of the turbine speed control was delayed, and there was a sudden pressure drop in the primary steam line. Weakly radioactive steam and water were released into the containment without polluting the environment, since all safety systems responded to the accident.

44826 Project 'HDR safety programme'. A survey. Mueller-Dietsche, W. *KFK Nachr.;* **9**: No. 2, 5-10(1977). (In German).

Specific research projects on the HDR: 1) Assessment of non-destructive test methods for PVs; 2) experimental determination of stress and failure analyses for a quantification of the safety margin; 3) experimental verification of calculation methods for LOCAs; 4) determination of vibrational loads and resulting stresses in earthquakes; 5) influencing parameters in containment leak rate tests for a standardization of the procedure.

44827 Radiation safety of nuclear power plants with large channel-type reactors. Egorov, Yu.A.; Polushkin, K.K.; Sklyarov, V.P.; Cherkashov, Yu.M. (State Atomic Energy Committee, Moscow). pp 353-363 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Experimental results obtained at operating light-water cooled nuclear reactor plants in the USSR and subsequent analysis showed that the measures to provide radiation safety adopted for design and realized in construction allow the plant to operate in accordance with established regulations. In order to confirm the design, radiation fields and coolants and discharge activities of the first RBM-K units have been studied. In addition, it was determined that analysis of fission fragment activity in the coolant, along with indications of the leakage control system, make it possible to monitor faults in the fuel element cans and keep them within permissible limits.

44828 Overview of the activated corrosion product reduction program for US power reactors. Murphy, T.D. (Office of Nuclear Reactor Regulation, Washington, DC). pp 364-373 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Recent studies have shown that radiation levels associated with reactor coolant components are increasing at U.S. nuclear power plants. Recent experience also shows that occupational radiation exposure to personnel is also increasing. This paper discusses one aspect of reducing exposure to personnel, that is, recent developments in the reduction of existing corrosion product radioactivity in reactor coolant systems and the minimization of the formation and build up of such activity.

44829 Criteria for uses of built-in exposure rate and airborne radioactivity monitoring systems in nuclear power plants. Todd, T.E. (Tennessee Valley Authority, Knoxville). pp 425-433 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The author has reviewed many documents dealing with criteria for the use of built-in radiation detection and measurements instrumentation in the radiation protection programs of nuclear power plants. All of the reviewed materials have presented vague statements purporting to justify arbitrary uses of built-in monitoring systems. This paper presents the long-needed definitive criteria. These criteria require the examination of each plant room air space for monitoring requirements. The built-in instrumentation constitutes the Exposure Rate Monitoring System (ERMS) and the Airborne Radioactivity Monitoring System (ARMS). The ERMS provides continuous monitoring of exposure rates and the ARMS provides continuous monitoring of airborne radioactivity concentrations. The functions of the ERMS and the ARMS are defined. Based on these functions, criteria are developed for the determination of plant locations that require monitoring with the ERMS and of plant room air spaces that require monitoring with the ARMS. Descriptions of equipment and methods that may be employed to monitor in accordance with the criteria are provided.

44830 Digital radiation monitoring system employing distributed microprocessors. Warman, E.A.; Ingeneri, S.M.; Newman, B.M.; Sowdon, T.L. (Stone and Webster Engineering Corp., Boston). pp 434-441 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

A digital radiation monitoring system employing distributed microprocessors for use in a nuclear power station is described. This includes a description of the system architecture and the functional aspects of the various levels within the system. The modular approach to the system's engineering is emphasized. Some examples of the types of output available from such a system are included along with a discussion of the operating advantages over the more traditional analog systems.

44831 Spatial distribution of fission product energy. Johnson, W.R.; Bass, R.B.; Littig, G.A.; Robinson, F.L.; Bracke, T.P. (Univ. of Virginia, Charlottesville). pp 889-896 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Experimental measurements of the spatial distribution of gamma-ray energy deposition from a simulated fission product source have been made in a mock-up of a light-water reactor fuel element under loss-of-coolant accident conditions. Thermoluminescence detectors (TLD) were used to make more than 7,000 individual measurements. The average fractional standard deviation for individual data points was about 6%. Experimentally determined TLD response functions were used to find energy deposition rates in the UO_2 and H_2O regions of the fuel element.

44832 Nuclear safety. A basic controversy. Deutsch, S.; Lannoye, P. *Rev. Phys. Appl.;* **32**: No. 9, 160-170(1976). (In French).

The authors analyse the controversies on the safety of nuclear reactors and the recomendations of the assessment commission. The following points are discussed: the emergency core cooling system with the analysis of the relative accidents, the probability and the consequences of accidents.

44833 (ORNL-tr—4660) **View toward the disposition of retired nuclear power stations.** Mori, M. Translated by T.E. Ohtani from *Genshiryoku Kogyo;* **22**: No. 4, 26-28(1976). 8p. Dep. NTIS, PC A02/MF A01.

Possible methods for the disposal of nuclear power plants following their operational life are discussed. Available options discussed include mothballing, in-place entombment, and dismantling.

ENERGY STORAGE

REFER ALSO TO CITATION(S) 44908, 44909

MAGNETIC

44834 (LA-UR—77-2754) **Structural design for a 10-GWh SMES vacuum vessel.** Bennett, J.G.; Anderson, C.A. (Los Alamos Scientific Lab., N.Mex. (USA)). 1978. Contract W-7405-ENG-36. 27p. Dep. NTIS, PC A03/MF A01.

Portions of document are illegible.

An approximate solution to the problem of the nonlinear elastic deformation of a periodically point-supported cylindrical shell is obtained. This solution is used to investigate the structural design of the vacuum vessel for the large underground superconducting magnetic energy storage (SMES) concept. Vacuum vessel designs are evaluated by varying such parameters as shell thickness, support spacing, material properties and physical configuration to keep the amount of material used and construction cost to a minimum.

44835 (N—77-33602) **User's manual: computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters.** Huffman, S. (Duke Univ., Durham, N.C. (USA). Dept. of Electrical Engineering). 30 Jun 1977. Contract NAS5-22475. 157p. (NASA-CR—152612; S—02). NTIS PC A08/MF A01.

Detailed instructions on the use of two computer-aided-design programs for designing the energy storage inductor for single winding and two winding dc to dc converters are provided. Step by step procedures are given to illustrate the formatting of user input data. The procedures are illustrated by eight sample design problems which include the user input and the computer program output.

COMPRESSED GAS

44836 (ANL/ES—64) **Parametric study of turbine systems for compressed air energy storage plants.** Kim, C.S.; Kartsounes, G.T. (Argonne National Lab., Ill. (USA)). Apr 1978. Contract W-31-109-ENG-38. 45p. Dep. NTIS, PC A03/MF A01.

A parametric study of possible turbine systems for compressed air energy storage (CAES) plants is made. The plant considered is divided into four subsystems: a turbine system, compressor system, reversible motor/generator, and an underground air storage reservoir. The turbine system comprises a high-pressure gas turbine, a low-pressure gas turbine, two combustors, and a recuperator. The compressor system consists of a low-pressure compressor, a booster compressor, an intercooler, and an aftercooler. A water-compensated mined cavern is the underground reservoir. Thermodynamic analyses of subsystem components are made, and plant performance is evaluated. The results are given in terms of the five parameters: specific air flow rate, specific storage volume, specific heat rate, specific compression rate, and overall plant efficiency. The effects on plant performance of design parameters such as inlet gas temperature and pressure to each turbine were analyzed. Also considered is the effect of using cooling air for turbine blades and vanes.

PUMPED HYDRO

44837 **Reservoirs for hydropower and improved pump-fed power stations in neighboring foreign countries.** Frohnholzer, J. *Energiewirtsch. Tagesfragen;* **17**: No. 11, 735-738(Nov 1977). (In German).

After a review of alpine water reservoirs, the power potential of these reservoirs for the electric power industries of 14 European countries is given, and detailed information is presented on the design and operation of more recent pumped-storage power plants in Belgium, France, and Austria.

FLYWHEELS

REFER ALSO TO CITATION(S) 44971, 45078

44838 (N—77-33603) **Design definition of a mechanical capacitor. Final report, June 1976—April 1977.** Michaelis, T.D.; Schlieban, E.W.; Scott, R.D. (New York State Government, Albany (USA)). May 1977. Contract NAS5-23650. 292p. (NASA-CR—152613). NTIS PC A13/MF A01.

A design study and analyses of a 10 kW-hr, 15 kW mechanical capacitor system was studied. It was determined that magnetically supported wheels constructed of advanced composites have the potential for high energy density and high power density. Structural concepts are analyzed that yield the highest energy density of any structural design yet reported. Particular attention was paid to the problem of 'friction' caused by magnetic and I to the second power R losses in the suspension and motor-generator subsystems, and low design friction levels have been achieved. The potentially long shelf life of this system, and the absence of wearing parts, provide superior performance over conventional flywheels supported with mechanical bearings. Costs and economies of energy storage wheels were reviewed briefly.

44839 (UCRL—50019-77-1, pp 2-7) **Flywheel program.** 19 Jan 1978.

In Organic Materials Division quarterly report, January—March 1977.

Research progress is reported on the following: (1) matrix resins for fiber composites; (2) optimal design of anisotropic (fiber-reinforced) flywheels; (3) composite flywheel design study; (4) dynamic fatigue; and (5) a rate-dependent criterion for crack growth. (TFD)

44840 **Power supply with flywheel storage.** Hensel, W.; Junduls, P.; Bialowons, W. (to Licentia Patent-Verwaltungs-G.m.b.H., Frankfurt am Main (Germany, F.R.)). German(FRG) Patent 2,546,777/A/. 21 Apr 1977. 21p. (In German).

In order to attain high overall efficiencies of power plants it has been recommended to balance out short term peak power periods by means of flywheels. The proposal relates to systems with synchronous machines connected to the grid via static converters. The following principle is proposed to solve this problem with relatively little technical expenditure: The shaft of the synchronous generator carries a flywheel and a dc motor with separate excitation to start the system. An intermediate dc circuit feeds the motor from the grid in low load periods and discharges the energy of the flywheel into the grid during peak load periods. If the mass moment of inertia is dimensioned properly, e.g. 60×10^3 kg/m², a reduction of the speed from 4,000 rpm to 2,000 rpm allows an energy of 1 MWh to be extracted additionally with an efficiency of approx. 90%. Further claims and examples describe other embodiments characterized by different arrangements of equipment and measuring and control systems.

THERMAL

REFER ALSO TO CITATION(S) 44558, 44559, 44560, 44561, 44562, 44563, 44621

44841 **Thermal distribution and storage system for solar and other heating and cooling.** Edwards, D.W. US Patent 4,069,973. 24 Jan 1978. Filed date 17 Nov 1975. 8p.

An apparatus is described for the storage of thermal energy and for the distribution of such thermal energy to the interior of a building. The preferred system utilizes prestressed, precast concrete decking panels with hollow cores through which a fluid conducting conduit extends to form a grid within the decking panels. Selected cores have spaced ports communicating with face surfaces of the panels to provide an air flow passage through the selected cores. Fluid from a primary heat storage is controllably circulated through the conduit so that the fluid and the panels provide a secondary storage as well as a heat radiator for continuous even heating while the air flow passages permit forced or gravity flow heating of air for rapidly compensating for an extreme or sudden heat loss.

44842 **Large heat storage tanks of double-walled, foam-insulated design.** Gruenhoff, H. (Thyssen Behaelter- und Lagertechnik, Froendenberg-Langschede (Germany, F.R.)). pp 23-30 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 22: Speicherung, fuehlbare Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Large thermal heat storage tanks are important both for use of solar and wind energy, as well as for the use of industrial waste heat, off-peak electricity, and for the improvement of the efficiencies of heat plants. This contribution presents various considerations in the design and application of thermal heat storage tanks.

44843 **Selection criteria and properties of materials for latent storage of thermal energy.** Schroeder, J. (Philips Forschungslaboratorium G.m.b.H., Aachen (Germany, F.R.)). pp 75-76 of Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 23: Speicherung, latente Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German, English)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

44844 **Energy cost reduction by latent heat buffers.** Sedlmayr, M. (Latent-Energie G.m.b.H. und Co. Entwicklungs-K.G., Remseck (Germany, F.R.)). pp 77 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 23: Speicherung, latente Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German, English)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

44845 **Heat exchange processes for latent heat storage devices.** Lindner, F. (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Stuttgart (Germany, F.R.)). pp 79-90 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 23: Spei-

cherung, latente Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The key problem of latent heat storage is the heat exchange between the latent heat storage material and the heat transport medium. If this heat exchange is not optimized, then the stored heat can only be extracted at a temperature much below the desired one. In the following paper the problem of heat exchange in latent heat storage units will be analyzed.

44846 Application of the chemical heat pump for heat storage: the system 'PAWA'. Doroszlai, P. (Pro Elektra A.G., Baden (Switzerland)). pp 99-113 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 23: Speicherung, latente Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

In the following shall be shown, how the old known principle of the absorption/refrigeration with solid absorbents can be used to create the chemical heat pump and heat storage system PAWA. The application of the chemical heat pump makes the room heating, cooling and the heating of domestic hot water with solar energy more efficient and allows the heat recuperation from the used ambient air. In case of longer periods of low solar radiation rates the same system may be used for the storage of heat generated with electrical power during the night period.

CHEMICAL

44847 (SAND—77-8056) **Thermochemical Energy Storage and Transport Program. Semiannual report, April 1977—September 1977.** Bramlette, T.T.; Mar, R.W. (comps.). (Sandia Labs., Livermore, Calif. (USA)). Mar 1978. Contract EY-76-C-04-0789. 122p. Dep. NTIS, PC A06/MF A01.

The objective of the Thermochemical Energy Storage and Transport (TEST) Program (managed by Sandia Laboratories, Livermore) is to develop reversible chemical reaction technologies for thermal energy storage and transport applications. TEST is one of three subprograms of a National Thermal Energy Storage (TES) Program. The objective of this National Program is to develop and disseminate thermal and thermochemical energy storage and transport technology which offers the potential for energy conservation or fuel substitution (nuclear, coal, or solar for petroleum). The other two subprograms of TES involves low- and high-temperature energy storage by sensible and latent methods. (TFD)

44848 Chemical storage of energy. Ritter, A. (Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr (Germany, F.R.). Inst. fuer Strahlenchemie). pp 91-97 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 23: Speicherung, latente Waerme. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The term 'Chemical Storage of Energy' covers all processes which take place as a result of structural and/or compositional change of the storage chemicals after energy absorption. Hence, they are clearly different from the physical storage methods which depend on changes of temperature or state of aggregation of the energy absorbing material. Contrary to the latter which are already used in practice, the chemical storage methods with a few exceptions are hypothetical models only. Within this framework ideas will be suggested for further reflexion rather than solutions which can be put into immediate commercial practice.

BATTERIES

44849 (DOE/ET—0014) **Battery and electrochemical systems program summary, FY 1977.** Webster, W.H. (ed.). (Department of Energy, Washington, D.C. (USA). Div. of Energy Storage Systems). Apr 1978. 156p. Dep. NTIS, PC A08/MF A01.

The success of wind and photovoltaic energy conversion systems for residential, commercial, and industrial applications is highly dependent on the development of a cost-effective battery storage system to provide power during periods of no wind or sunlight. The use of 3 to 9 million electric cars by the year 2000 will result in an oil saving from 35 to 90 million barrels per year. During FY 1977, STOR committed $13.3 million of its funds to these electrochemical programs, and managed an additional $5.6 million for the Division of Transportation Energy Conservation to develop near-term batteries for electric vehicles. This publication consists of summaries of all these programs, including contractors, major subcontracts, names of program managers, funding, and a brief description of the objectives and status of each program.

DESIGN AND DEVELOPMENT

44850 Electricity from better batteries. Developments in the field of static energy sources in Great Britain. Ford, E. *VDI (Ver. Dtsch. Ing.) Nachr.;* **31**: No. 36, 9(Sep 1977). (In German).

The article presents a survey of development activities concerning electric batteries in Great Britain. Work of the main research and industrial firms is discussed, and possibilities of application for electric batteries are illustrated by some specially selected examples.

MATERIALS, COMPONENTS, AND AUXILIARIES

44851 (AD-A—048330) **Solid electrolyte battery materials. Final report, 1 July 1976—31 September 1977.** Huggins, R.A. (Stanford Univ., Calif. (USA). Center for Materials Research). Nov 1977. Contract N00014-76-C-0940. 15p. (CMR—77-15). NTIS PC A02/MF A01.

This is the final report on this contract. Work involved the preparation of lithium nitride and a number of other potential ionic conductors and mixed ionic-electronic conductors. Most attention was given to lithium ionic conductors. Crystal structure information was obtained, and measurements made of ionic conductivity and other relevant properties.

44852 (N—77-33601) **Review of electrochemical impregnation for nickel/cadmium cells.** Gross, S. (Boeing Aerospace Co., Seattle, Wash. (USA). Electric Power Technology Div.). Aug 1977. Contracts NAS7-100;JPL-953984. 116p. (NASA-CR—155155). NTIS PC A06/MF A01.

A method of loading active material within the electrodes of nickel/cadmium cells is examined. The basic process of electrochemical impregnation of these electrodes is detailed; the principle assemblies that, when current is applied, reactions occur which remove hydrogen ions from solution, and make the interior of the plaque less acidic. Electrodes result which are superior in energy density, stability, and life. The technology is reviewed and illustrated with typical performance data. Recommendations are made for additional research and development.

ENERGY MANAGEMENT AND POLICY

REFER ALSO TO CITATION(S) 44275

ENERGY ANALYSIS AND MODELING

44853 (PB—273896) **Energy-cased analysis of alternative production methods and cropping systems in the Corn belt.** Doering, O.C. III. (Purdue Univ., Lafayette, Ind. (USA). Agricultural Experiment Station). Jun 1977. 47p. NTIS PC A03/MF A01.

This report identifies and evaluates cropping systems and production methods for major Corn Belt crops (corn, Soybeams, wheat, and alfalfa) which would reduce the total energy imputs relative to the amount of product. The quantity and quality of inputs with respect to the quantity and quality of outputs were examined.

44854 (PB—274080) **Analyses of methods for the determination of water availability for energy development.** Longenbaugh, R.A.; Wymore, I.F. (Colorado State Univ., Fort Collins (USA); Colorado Div. of Water Resources, Denver (USA)). May 1977. Contract FEA-CA-05-50041-00. 134p. NTIS PC A07/MF A01.

Portions of this document are not fully legible.

This report discusses ways that computer programs, using hydrologic, climatic, legal, and economic data, can be used to provide information for use by planners and water administrators in evaluating the impact of water availability on energy development. This included definition of the types of information needs, evaluation of existing compurer program capabilities, analyses of data requirements for specific computer program and/or to provide the specific information, selection of a group of computer programs that could provide the various levels of needed information, linking the computer programs to data sources, and applying the specific methodologies to a prototype area to demonstrate how specific information would be made available for use in the decision process.

44855 (PB—274094) **Developing an energy input-output simulator (AGNRG) for analysis of alternative cropping systems in the Corn Belt (energy in agriculture).** Muller, R.E. Jr.; Peart, R.M.; Parsons, S.D.; Srinivasan, G.; Pickett, R.C. (Purdue Univ., Lafayette, Ind. (USA). Agricultural Experiment Station). Jun 1977. 46p. NTIS PC A03/MF A01.

The simulator was used to evaluate the technical feasibility of several energy-saving practices and to compare them with conventional practices. Its results then were used to evaluate the economic feasibility of the practices in the Purdue Farm Management Model B or a related farm management linear programming model. The simulator, which goes through the field operations of tilling, planting, etc., through harvesting, does this on the basis of actual weather data for a specific year. The crop yields are determined on the basis of the same weather data through the use of crop yield submodels. (Color illustrations reporduced in black and white)

ECONOMICS AND SOCIOLOGY

REFER ALSO TO CITATION(S) 44125, 44865, 44963, 45363, 46081

44856 (NP—23264) **Progress report for the period January 1—June 30, 1977.** (Koeln Univ. (Germany, F.R.). Energiewirtschaftliches Inst.). 1977. 28p. (In German). Dep. NTIS (US Sales Only), PC A03/MF A01.

Activities at the Energy Economics Institute at the University of Cologne during the first half of 1977 are summarized. Information is included on lectures, meetings, publications, professional activities, theses presented, dissertations, and international contacts.

44857 (PB—275826) **Disaggregated financial data and analysis for the domestic motor vehicle manufacturers. Technical report.** (Department of Transportation, Cambridge, Mass. (USA). Transportation Systems Center). Jul 1977. 68p. NTIS PC A04/MF A01.

Financial data for the four principal U.S. automobile manufacturers is abstracted from annual reports and 10-K forms. The data are analyzed to provide estimates of capital available for product improvement and to evaluate possible financial impacts of automobile fuel economy regulations.

44858 Relation between energy - ecology - economy. An investigation with examples from Brazil and other Third World countries. Horn, J. pp 33-38 of Konferenz ueber Energie und technologische Entwicklung: die Loesung der Energiekrise. Wiesbaden, Germany, F.R.; Campaigner Verl. (1977). (In German)

From Conference on energy and technological development) solution to the energy crisis; Essen, F.R. Germany (6 Jun 1977).

In North America and Western Europe, supporters of zero growth think that economy and energy, on the one hand, and an intact ecology, on the other, are opposites or opposing tendencies which cannot go hand in hand. These people also contest the claim that there is a linear correlation between a developing ecology and technology and increased energy consumption. The author thinks that the above basic assumptions are wrong and not in agreement with either the laws of evolution of the geosphere or with the necessities of the present political and economic situation. Giving an outline of the history of evolution and the present situation, especially in the developing countries, he shows that there is a linear, self-strengthening correlation between economic growth and capital-intensive technological innovation on the one hand and environmental improvement on the other.

44859 Solar publicity - wishes and realities. Hilbert, K.D. pp 401-411 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 29: Wirtschaftliche Aspekte. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Worldwide a solar technology movement has begun. Almost unthinkable results have been accomplished in a short time. But is there a general consent on what should be published about solar energy. Do public institutions, industrie, associations, societies and trades influence the creation of a public opinion. This paper attempts to draw a picture of the present situation in the Federal Republic of Germany and to formulate suggestions for concepts for solar publicity.

ENVIRONMENT, HEALTH, AND SAFETY

REFER ALSO TO CITATION(S) 44878, 44888, 45293, 45321, 45325, 45362, 45363

44860 (PB—274411) **Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report.** Davey, W.B. (National Association of Conservation Districts, Washington, D.C. (USA); Soil Conservation Service, Washington, D.C. (USA); Bureau of Land Management, Washington, D.C. (USA)). Jun 1977. 353p. NTIS PC A16/MF A01.

This publication highlights potential conservation district involvement in the preparation and implementation of state and areawide water quality management plans developed pursuant to Section 208 of Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). It is keyed to the required water quality management planning elements specified in Environmental Protection Agency regulations (40 CFR Part 131.11, elements (a) through (p)). The document is directed primarily to water quality planners, conservation districts, and state soil conservation agencies (boards, commissions, committees, councils, or equivalent). Those federal and state agencies with whom conservation districts have cooperative working arrangements as well as various public interest groups may also find the material of interest.

44861 Planning and the rural environment. Davidson, J.; Wibberley, G. Elmsford, NY; Pergamon Press Inc. (1977). 237p.

This book is about the changing fabric of the open countryside: a field neglected by planners who have been preoccupied with the built environment of both town and country. A central theme is the conflict of interest between some of the major rural users and groups. The repercussions for the countryside of changing activities and attitudes in five main areas of rural resource planning are examined: farming, forestry, leisure, and the conservation of wildlife and landscape. Their interactions are then explored in the contrasting environments of the urban fringe and the uplands. Finally, the authors review the development of rural planning, discuss some of the technical and philosophical problems that have emerged, and speculate upon a variety of issues that will shape the countryside of the future. They conclude that the rural environment is changing much more rapidly than many people think; within a generation, many of the characteristics of the present countryside could disappear.

ENERGY RESOURCES

REFER ALSO TO CITATION(S) 44092, 44854, 44860, 44861, 44959, 45325, 45363

44862 (PB—274278) **Directions in U.S. water research: 1978—1982. Final draft report.** (Federal Coordinating Council for Science, Engineering and Technology, Washington, D.C. (USA). Committee on Water Resources Research). Apr 1977. 153p. NTIS PC A08/MF A01.

This report analyzes the effectiveness of the 10-year program of water resources research (1965-75), sets forth a perspective for the role that our water resources must play in the U.S., and identifies issues in which water is a vital consideration. In this report, the Committee on Water Resources Research (COWRR) attempted to refocus the needed program in water research for at least the next five years.

44863 (PB—274408) **Kentucky energy resource utilization program. Semiannual report, 1 January—30 June 1977.** (Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). Jul 1977. 84p. NTIS PC A05/MF A01.

This report describes progress on the various projects comprising the research and development component of the Kentucky Energy Resource Utilization Program during the six-month period from January 1 - June 30, 1977. The work described is an extension and expansion of the program undertaken by the Institute for Mining and Minerals Research during the 1972-1974 biennium. The 90 projects now underway are grouped into four divisions: Mining, Process Development, Geology and Reserves, and Materials Analysis. A summary of progress for each project is included.

44864 Digest of mining claim laws. Pruitt, R.G. Jr. (comp. and ed.). Boulder, CO; Rocky Mountain Mineral Law Foundation (1977). 184p. $15.00.

This digest was compiled for the person who locates mining claims and the person who evaluates existing mining-claim locations for compliance with applicable laws. The Digest is limited to matters that directly affect the location and maintenance of unpatented mining claims, and does not cover issues related to taxation, regulation of mines and mining, or legal relationships between mining claim owners. An introductory chapter on the law of mining claims is followed by a chapter on Federal Mining Claim Laws (with comments). Some state mining claims laws with comments (Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming) are discussed in Chapter III. Chapter IV includes some common mining claims forms. (MCW)

44865 World food problem and U.S. food politics and policies: 1972—1976. Talbot, R.B. Ames, IA; Iowa State University Press (1977). 400p. $7.50.

A readings book.

Food has become an instrument of power during the last few years of some significance in U.S. foreign policy. This reading book of approximately 75 items is arranged in 12 subject areas, namely: The World Food Problem--What Is It; What Should Be Done--A Spectrum of Perspectives; From U.S. Farm Politics to U.S. Food Politics; The Approaching World Food Crisis and U.S. Food Politics, 1971 to 1974; The World Food Conference, November 5 to 16, 1974, Rome, Italy; World Food Institution Building--A Continuing Process; The Politics of a World Grain Reserve; Food Aid and Development Assistance--Interweaving Political Ideology, Interest, and Strategy; U.S. Foreign Agricultural Trade and the Multilateral Trade Negotiations; The US-USSR Grains Agreement of 1975; Instruments of Food Policy in the Making; and The World Food Problem and U.S. Food Politics--Near-Future Directions. (MCW)

RESEARCH AND DEVELOPMENT

REFER ALSO TO CITATION(S) 44862, 44884

44866 Managing the flow of technology: technology transfer and the dissemination of technological information within the R and D organization. Allen, T.J. Cambridge, MA; Massachusetts Institute of Technology (1977). 332p. $20.00.

The end product of a decade of empirical study into communication behavior among technologists, this book gives a comprehensive view of the management of technical information. It attempts a unifying, systemic approach, unlike its predecessors in the field in which findings were not integrated into a more-complete presentation of the communication process in science or technology. Most important, the study shows how human and organizational systems can be restructured in order to bring about better person-to-person contact. Professor Allen offers models to describe organization and communication and to predict the relationships among the variables. Chapter 1 introduces a distinction between the scientist and the technologist, whose differences in orientation have profound implications. Chapter 2 describes the research on which the book is based. Chapter 3 is an overview of the communication system in technology. Chapter 4 discusses the acquisition of technological information by the research and development organization. After the discussion in Chapter 5 of the need to promote communication and how it can be met, Chapter 6 returns to the topic of information acquisition and expands on it. Chapters 7 to 9 talk about how an organization's structure, and even its architecture and office layout, affect information dissemination. Chapter 10 offers a conclusion.

44867 Economic and social aspects of research and development. Dettmering, W. (Verein Deutscher Ingenieure, Duesseldorf (Germany, F.R.)). *Tech. Mitt.;* **70**: No. 12, 838-840(Dec 1977). (In German).

Future taks of R and D are outlined. The importance of basic research, applied research, and industrial R and D, up to the successful completion of a technical innovation, as well as the effective use of public funds are dealt with.

NUCLEAR ENERGY

REFER ALSO TO CITATION(S) 44276, 44296, 44635, 44711, 44712, 44869

44868 Responsibility of research for the future of society. Schmidt, H. *Bull. Schweiz. Elektrotech. Ver.;* No. 72, 673-679(Jul 1977). (In German).

Full text of the speech with which the Chancellor addressed the Deutsche Forschungsgemeinschaft. In this speech he states, among other things, that in his opinion nuclear power will be indispensable in the long run. However, in a democratic society, projects of this dimension cannot be realized without the consent of the public. Therefore, one should early open one's eyes and ears for problems which harass people today of may harass them tomorrow.

WASTE HEAT UTILIZATION

REFER ALSO TO CITATION(S) 44939

44869 (AECL—5689) **Utilization of waste heat from electricity generating stations.** Robertson, R.F.S. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jun 1977. 19p. Dep. NTIS (US Sales Only), PC A03/MF A01.

Historically the nuclear power station has been designed solely as an electricity producer. But in Canada today only 15 percent of our energy consumption is as electricity. The non-electrical needs today are supplied almost entirely by natural gas and oil. There is an incentive to see whether a nuclear station could supply energy for some of these non-electrical needs, thus freeing gas and oil for uses for which they may be more valuable and suitable, especially in transportation. A group located at the Whiteshell Nuclear Research Establishment undertook a series of studies to examine this problem. These studies were done in sufficient depth to provide technological and economic answers, and as a result several reports have been published on various topics. In this report, the findings from these studies are drawn together in an assessment of the potential in Canada for using waste heat.

44870 Cogeneration of steam and electric power. Noyes, R. (ed.). Park Ridge, NJ; Noyes Data Corporation (1978). 268p. $36.00.

Four chapters are included in this book to discuss the cogeneration concept. The Dow Chemical Company has considerable experience in the field of cogeneration and meets a large proportion of its steam and electricity requirements through cogeneration. Their experiences are related in the initial paper, Dow Chemical Company Study. Then the experiences on cogeneration at Thermo Electron Corporation are told in the next chapter. A Resource Planning Associates Study summarizes the potential for cogeneration development in 6 major industries (such as the chemical, petroleum-refining, paper, and steel industries) with and without government actions. Finally, a Resource Planning Associates Study examines the technical aspects of cogeneration. A bibliography lists the reports from which these studies were taken. (MCW)

CONSERVATION

REFER ALSO TO CITATION(S) 44855, 44939, 44946, 44948, 44955, 44963

44871 Energy conservation: policy considerations for The States. Lexington, KY; Council of State Governments (1976). 54p. $3.00.

Energy conservation is a relatively recent policy concern for state officials involved in environmental and growth issues. This report is addressed to state officials responsible for developing effective energy conservation policies and programs; it seeks to balance the myriad studies and recommendations for state actions by focusing on potential institutional and market constraints to those recommendations. The report analyzes trends in state energy conservation activities, identifies general assumptions underlying these actions, and discusses some policy considerations for state involvement in energy conservation efforts. It offers a critical examination of energy-conservation opportunities and problems in the two program areas that are the major targets of state energy-conservation efforts. These are the regulation of public utilities for energy conservation objectives and improved efficiency of energy use in buildings. The research agenda identified by the report focuses on informational needs and institutional or capacity building required for effective state energy conservation programs.

44872 (PB—274492) **Energy emergency conservation and allocation plan.** (Minnesota Energy Agency, St. Paul (USA)). Jan 1977. 39p. NTIS PC A03/MF A01.

In 1974 the Minnesota State Legislature directed that an Energy Emergency Conservation and Allocation Plan be prepared for use in the event of an energy supply emergency. The plan is intended to establish priorities of energy usage and to provide conservation actions for reducing energy usage. This report discusses details of the plan.

44873 Advisory Council on Energy Conservation. Paper 5. Road vehicle and engine design: short- and medium-term energy considerations. London; Her Majesty's Stationery Office (1977). 43p. £ 1.75 net.

The special Road Vehicle and Engine Design Working Group set up by the Advisory Council on Energy Conservation prepared this document. The vehicle situation in the United Kingdom and possible areas and methods of improvement are discussed in 5 parts: fuel savings from change in passenger car design; possible improvements in the fuel consumption of commercial vehicles including freight, buses, and coaches; possibilities for improvements in the fuel consumption of conventional reciprocating engines (improved power units for motor vehicles); exhaust pollution regulations (fuel consumption); the fuel supply position. (MCW)

SUPPLY, DEMAND, AND FORECASTING

REFER ALSO TO CITATION(S) 44872, 44893

44874 (CONF-760688—, pp 25-79) **Energy supply and demand forecasts - an overview.** Manders, P.M. (Dept. of Energy, Mines and Resources). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 4: nuclear energy and the industry (part 1).

Estimates of energy supplies and demand in Canada over the next 15 years are presented. The modeling exercise and methodology, derivation of supply forecasts, and policy implications are rigorously explored. (8 references).

44875 (CONF-780444—1) **Will there be an energy crisis in 1985.** Lantzke, U. (International Energy Agency, 75 - Paris (France)). 1978. 25p. Dep. NTIS (US Sales Only), PC A02/MF A01.

From Meeting of the nikkei center; Tokyo, Japan (10 Apr 1978).

Five key points were made: (1) Energy is a major element underlying current problems besetting the world economy. Uncertainty about energy policy is contributing to trade problems, persistent inflation, and lagging economic activity. Stronger energy policies are needed in all of the industrial countries. (2) The current oil market surplus is only a temporary phenomenon and should not be a cause for slackening efforts to strengthen energy policies immediately. Current slack conditions in the world oil market do not alter the underlying long-term trend of rising oil consumption which still threatens to bring about a major energy crisis. Because of growing lead times for energy policy action to take effect, the necessary policies need to be set in place immediately. (3) Oil is not the only problem in energy policy. The lack of energy consciousness among the public is a major obstacle to conservation efforts. Lengthy judicial and regulatory procedures are hampering efforts to expand nuclear power. Large-scale substitution of oil by coal will require major investments in mining, transportation infrastructure and coal-burning facilities. (4) Existing policy efforts of IEA Member countries will be inadequate to achieve the objective of holding IEA oil imports to 26m b/d by 1985. It would be a mistake to assume that another energy crisis or large real price increases in energy is inevitable. (DLC)

44876 (EPRI-EA—634-SR) **Supply 77: EPRI annual energy supply forecasts.** Browne, T.E.; Chamberlin, J.H.; Halter, A.N.; Riley, R.E.; Searl, M.F.; Searls, J.; Urbanek, R.J. (Electric Power Research Inst., Palo Alto, Calif. (USA)). May 1978. 161p. Dep. NTIS, PC A08/MF A01.

Domestic energy production and prices by fuel type, as well as imports, are projected for the 1975 to 2000 period. Natural gas production is expected to increase gradually to 1990 and then decline. Output of domestic petroleum liquids, including shale oil, peaks in the 1990 to 1995 period and then declines. Shale oil output reaches one million barrels a day by the end of the century. Coal production capability increases throughout the period, reaching 2.6 billion tons per year by the year 2000, providing markets develop for this output level. Nuclear power growth is expected to accelerate above present trends later in the century, reaching 380 gigawatts in the year 2000. At this level, nuclear power would produce as much electricity as the burning of an additional 1.3 billion tons of coal. A reference electric power case and two other levels of output are presented. These levels of output are analyzed in connection with reference levels of fuel and construction costs, as well as variations on these reference levels. Measured in constant 1976 dollars, average revenue requirements per kilowatt-hour for electric power output range from a likely low of 3.52 cents per kilowatt-hour to a likely high of 3.99 cents per kilowatt-hour, with a reference case figure of 3.71 cents. The comparable figure for 1976 was 2.89 cents.

44877 **Energy supplies: a look ahead.** Searl, M. (Electric Power Research Inst., Palo Alto, CA). *Aware;* No. 93, 5-9(Jun 1978).

Reprinted from April 1978 EPRI Journal.

44878 (PB—274685) **Development of the 1975 area source inventory for the state of Illinois. Final report.** Wiltsee, K.W. Jr. (Abcor, Inc., Wilmington, Mass. (USA). Walden Research Div.). Dec 1976. 56p. NTIS PC A04/MF A01.

Estimates of the 1975 state stationery- and mobile-source fuel use were obtained or projected from published documents. County allocations were made. This procedure uses county population and employment by SIC code to apportion state fuel use to the county level. Estimates of activity in non-fuel use categories such as solid-waste disposal and fugitive emissions were performed using EPA guidelines.

44879 **Estimation of characteristic periods for the development of energy-supply systems.** Nitsch, J. *Brennst.-Woerme-Kraft;* **29**: No. 11, 439-444(Nov 1977). (In German).

From Energy policies forum of the Landesregierung and the Universitaet Stuttgart; Stuttgart, Germany, F.R. (9 - 12 May 1977).

The article is intended to contribute to a differentiated analysis of the critical time constants that essentially influence the speed of the development of energy-supply systems. Most of the investigations of the last few years concentrate mainly on the determination of the technically optimal development strategy for the energy transformation range. It is thereby, more or less, assumed that the structure of supply and consumption will adjust itself eventually to the changed market situation too. However, there are still numerous individual factors, not yet sufficiently quantified, that influence the periods of adaptation. The author shows, specially for the example of private households, how more exact criteria can be determined by an accurate analysis of the infrastructure of consumers and energy distribution. 5 figs., 1 table, 25 refs.

44880 **Open questions in energy supply.** Burgbacher, F. (Koeln Univ. (Germany, F.R.)). *Oel- Gasfeuerung;* **22**: No. 5, 260-262(May 1977). (In German).

44881 **Analysis of the final energy demand in individual demand sectors and projection of its future development.** Reents, H.; Heckler, R. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Programmgruppe Systemforschung und Technologische Entwicklung). pp 311-337 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 27: Energiebedarf. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The detailed knowledge of the demand structures and their determing factors is an important precondition for estimating the possible developments of the future energy demand. In this report the past development of the final energy demand in the different demand categories-private households, commercial sector, industry and transportation—analyzed. It is shown, how alternative actions (insulation, gas heat pump) can influence the future development of the final energy demand.

44882 **Energy forecasts with special concern of renewable energy sources.** Bauerschmidt, R. (Institut fuer Angewandte Systemforschung und Prognose (ISP), Hannover (Germany, F.R.)). pp 339-348 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 27: Energiebedarf. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Correlations between gross national product and energy consumption are not sufficient for energy forecasts. Instead, it should be divided between different form of energy use in households and sectors of the economy. Uncertainty in forecasts and policy options are represented in scenarios. It becomes quite clear that such a way of analysis is to be chosen if one wants to take renewable sources into consideration.

POLICY, LEGISLATION, AND REGULATION

REFER ALSO TO CITATION(S) 44124, 44144, 44145, 44860, 44864, 44872, 44875, 45362

44883 (CED—78-107) **Marine approaches to U.S. ports: a flexible and obstruction-free system is needed.** Staats, E.B. (General Accounting Office, Washington, D.C. (USA)). 2 May 1978. 16p. General Accounting Office, Washington, DC.

Report to Congress by the Comptroller General of the United States.

A controversy between energy and maritime interests over common use of the ocean caused by exploration for oil and gas resources of the Outer Continental Shelf needs prompt resolution. The Congress should: (1) authorize the Coast Guard to designate obstruction-free shipping routes on the Outer Continental Shelf; (2) require the Coast Guard to relocate or adjust designated shipping routes when necessary for the exploration and development of oil and gas deposits, and (3) authorize the Coast Guard to veto any obstruction to designated shipping routes until the shipping routes can be relocated or adjusted.

44884 **Perspective of the energy policy for Europe: demands and recommendations concerning energy and research policy for overcoming the present stagnation.** Bandmann, H. pp 43-46 of Konferenz ueber Energie und technologische Entwicklung: die Loesung der Energiekrise. Wiesbaden, Germany, F.R.; Campaigner Verl. (1977). (In German)

From Conference on energy and technological development) solution to the energy crisis; Essen, F.R. Germany (6 Jun 1977).

Giving a historical perspective which analyzes the close connection between the energy density used for production and the increase per capita consumption of energy and economic wealth, the

author attempts to show that a delay in the development and application of new production technologies will have catastrophic consequences for humanity. The only possible production technology is that based on controlled nuclear fusion. This is more than a forced development of a new reactor technology. Rather, controlled nuclear fusion is seen as a global pacemaker for science, technology, and industrial production. The paper discusses the R and D strategy of an immediate programme drawn up by the Fusion Energy Foundation (FEF) as well as the economic and financial conditions required to make such a programme possible.

44885 Promotion of solar technology in Baden-Wuerttemberg. Grawe, J. (Ministerium fuer Wirtschaft, Mittelstand und Verkehr Baden-Wuerttemberg, Stuttgart (Germany, F.R.)). pp 385-391 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 29: Wirtschaftliche Aspekte. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

As the first state of the Federal Republic of Germany, Baden-Wuerttemberg has passed an energy conservation program. It is part of an overall conception for the supply of the future energy demand and endowed with 100 million DM. In addition to the extension of district-heating, the installation of solar water-heating systems as well as research, development and demonstration projects for the utilization of solar energy of other regenerative energy sources in private and public buildings will be promoted. The measures in question are described.

FOSSIL FUELS

REFER ALSO TO CITATION(S) 44090, 44098, 44150, 44896

COAL

REFER ALSO TO CITATION(S) 44092, 44124, 44125, 44141, 44142, 44144, 44145

44886 Coal on the switchback: the coal industry since nationalisation. Berkovitch, I. London; George Allen and Unwin Ltd. (1977). 237p. $17.50.

In recent decades world energy consumption has increased at a compound rate of about 5½ percent per annum. In meeting this demand, coal has lost ground to oil and natural gas. A major consequence has been growing dependence on imported fuels--particularly oil from Arab countries--by all the industrialized countries, including the USA, until recently a fuel exporter. Yet coal has by far the greater reserves. Britain broadly followed world trends in the period after the Second World War, at first seeking to build up its coal industry, then systematically closing it down in pursuit of a cheap fuel policy, interfering little with the switch to cheaper oil. What was the background to this policy. How do the chief actors now justify their parts in that drama that led the country close to the risk of economic strangulation. Both official and unofficial explanations of these central issues of policy are treated and analyzed in some detail in the later chapters of this book. By 1974, the newly arrived Labour government, after the reappraisals following the rapid five-fold increase in oil prices, expressed a commitment to building the coal industry. It also took major decisions on nuclear policy which, despite massive investment, was contributing only some 3 percent to the primary energy input. And, of course, oil from the North Sea was expected to make Britain a net exporter of oil from about 1980, while further discoveries of gas promised a greater contribution of this fuel to future energy supplies. Repercussions of these new features form the theme of the concluding chapters.

PETROLEUM

REFER ALSO TO CITATION(S) 44185, 44186

NATURAL GAS

44887 Problems of price determination for gas due to connections between the international markets of natural gas supply and demand in the Federal Republic of Germany. DIW study on changes proposed by the Monopoly Commission. Dolinski, U. (Deutsches Inst. fuer Wirtschaftsforschung, Berlin (Germany, F.R.)). *Brennst.-Waerme-Kraft;* **29**: No. 11, 435-439(Nov 1977). (In German).

The article shows the results of an investigation by the German Institute for Economy Research (DIW) in Berlin, dealing with changes proposed by the Monopoly Commission with regard to price determination in the West German gas industry. The dependence of the West German natural gas purchases on the international conditions on the world gas markets are shown. After analyzing these feedback effects, the DIW investigates the position of the West German gas industry on the national energy market as well as price determination according to the principles of investment. Finally, the article deals critically with possible effects, if a (so-called) uniform price for the West German gas industry is introduced, as proposed by the Monopoly Commission.

44888 Report of the inquiry into serious gas explosions. King, P.J.; Clegg, G.T.; Walters, W.J. London; Her Majesty's Stationery Office (1977). 108p. £ 1.75 net.

An inquiry into recent such explosions at Bristol, Brentford, Beckenham, Bradford, and elsewhere was conducted to establish the extent of common factors that may have been present against the background of the statistics relating to recent experience of serious gas explosions. It also considered improvements to existing procedures or systems or any new measures that migh reasonably be implemented--and that could be expected to lead to a reduction in the severity of such incidents. This report studies the underlying causes and makes a number of recommendations to help reduce the number of accidents. (MCW)

HYDROGEN AND SYNTHETIC FUELS

REFER ALSO TO CITATION(S) 44326

ELECTRIC POWER

44889 (NP—22552) **Electric Utility Rate Design Study: technology for utilizing off-peak energy, Topic 8.** (National Economic Research Associates, New York (USA)). 15 Oct 1977. 90p. EPRI, Palo Alto, CA.

Task Force 8 examines the technological possibilities available for the utilization of off-peak electricity. Judicious use of restrictions and incentives may result in improved load factors for utility distribution systems, with implied savings in investment and operation costs. This report treats equipment that customers may employ to utilize off-peak electric energy in response to incentives provided by the utility; the primary emphasis is on equipment that is already available and that has been tested. Then the report is devoted to conventional appliances and equipment now in use by residential, farm, and commercial consumers. For this purpose, electric appliances and equipment are divided into two groups: discretionary and nondiscretionary. Discretionary appliances and equipment are those for which the time of use and length of use are controlled directly by the consumer. Nondiscretionary appliances and equipment are those for which the time of use and length of use are not directly controlled by the consumers.

44890 (NP—22554) **Electric Utility Rate Design Study: how to quantify marginal costs, Topic 4 results for Tennessee Valley Authority.** (National Economic Research Associates, New York (USA)). 16 Dec 1977. 73p. EPRI, Palo Alto, CA.

This report presents the computations of time-differentiated marginal costs of the Tennessee Valley Authority (TVA). The unique characteristics of the TVA system--large size, diverse generating sources plus seasonal diversity exchanges with neighboring systems, large amounts of weather-sensitive loads in both summer and winter, and large amounts of extremely high-load-factor industrial sales--added considerably to the task. The TVA generating system consists of 29 hydroelectric generating plants, 12 coal-fueled steam generating plants, one nuclear plant and four gas turbine plants now in operation. In addition, eight Corps of Engineers' dams in the Cumberland River basin and 12 dams owned by the Aluminum Company of America on Tennessee River tributaries make power available to TVA under long-term contracts. TVA is a bulk power supplier and does not own any distribution facilities. Therefore, this report addresses generation and transmission costs only. The methodology followed is that which has been laid down in the body of NERA's report on Topic 4. (MCW)

44891 (NP—22555) **Electric Utility Rate Design Study: how to quantify marginal costs, a reply to Task Force 4 comments.** (National Economic Research Associates, New York (USA)). 19 Dec 1977. 33p. EPRI, Palo Alto, CA.

In the quest for a costing methodology suitable for peak-load pricing, NERA has formulated for EPRI the Topic 4 report "How to Quantify Marginal Costs" which outlines the methodology used to determine time-differentiated marginal costs. Prices for electric service are economically efficient when based upon marginal costs, and these marginal costs are generally time-differentiated. In character with the cooperative spirit of the EPRI "Electric Utility Rate Design Study", Task Force 4 has commented on NERA's Topic 4 report. In this paper, pursuant to Task 3.4, the authors respond to those comments, attempting to provide answers to the majority of questions or criticisms but, more importantly, distilling the spirit of

the comments and producing a paper that complements the Topic 4 report while shedding more light upon what is felt to be the appropriate costing methodology. Comments are made on the subjects as specified in Task Force 4: introduction and data sources, marginal generating costs; selecting and assessing costs to rating periods; marginal transmission and distribution costs; computation of carrying charges; and marginal losses.

44892 (NP—22556) **Electric Utility Rate Design Study: making the transition from unit marginal costs to rates. Results for Portland General Electric Company.** (National Economic Research Associates, New York (USA)). 20 Dec 1977. 16p. EPRI, Palo Alto, CA.

Attachment B of the PGE rate design report prepared by NERA for EPRI under Topic 5 shows the unit marginal costs for each rate schedule. These costs are based on the PGE costing study prepared by NERA under Topic 4. The first step in making the cost-to-rates transition was to derive estimates for the costs at different voltage levels. These distribution costs (and distribution losses) were removed from the costs to be used in determining rates for transmission service. An analysis of primary costs was performed, and primary costs (estimated from this analysis to be 60 percent of distribution costs) were removed from the costs to be used in determining rates for primary service. The distribution costs in the costing study are expressed per kilowatt of system peak contribution. Distribution cost is, however, related to the whole gamut of demands, from system peak contribution to individual maximum. This paper assesses distribution-cost responsibility to classes based upon class peaks. This has been done by means of adjustment factors based upon ratios between class peak and class contribution to system peak.

44893 (PB—274081) **The 1976 Alaska power survey. Volume 2.** (Federal Power Commission, Washington, D.C. (USA)). 1976. 550p. NTIS PC A23/MF A01.

Volume Two of the 1976 Alaska Power Survey is comprised of the reports to the Federal Power Commission (FPC) by five advisory committees which were established to assemble and evaluate the Survey data. The five committees are the Executive Advisory Committee and the four Technical Advisory Committees on (1) Resources and Electric Power Generation, (2) Economic Analysis and Load Projections, (3) System Coordination and Interconnection, and (4) Environmental Considerations and Consumer Affairs. The Survey provides guidelines to assist government, industry and the public in determining the future development of electric power systems in Alaska.

44894 **International cooperation in MHD power generation.** Chernyshev, V. (International Atomic Energy Agency, Vienna). *Aware;* No. 93, 9-11(Jun 1978).

Reprinted from IAEA Bulletin, Volume 20, Number 1.

ELECTRIC POWER GENERATION

44895 **Situation of the electric power industry.** *Konkurito Janaru;* **28**: No. 2, 45-60(Sep 1977). (In German).

In spite of the different directions of development for the different energy carriers, the total consumption of primary energy in the FRG increased as expected compared to the year before. The consumption of nuclear power, natural gas, and hydropower increased while mineral oil remained slightly, and coal and brown coal markedly, below last year's results. In accordance with the different consumption curves, heating fuel oil prices decreased during the last few months while natural gas and fuel prices increased and coal and electric power prices remained constant. This status report gives a large number of figures on all the energy carriers and tries to indicate trends in the German electric power industry mainly by means of quarter-annual comparisons.

CONSUMPTION AND UTILIZATION

REFER ALSO TO CITATION(S) 44916, 44959

44896 **Digest of United Kingdom energy statistics, 1977.** London; Her Majesty's Stationery Office (1977). 146p. £ 9.00 net.

This issue of the Digest updates 1976 statistics with some revisions indicated. The first section covers general energy statistics and includes tables showing each fuel in original units of measurement, in coal equivalent, in oil equivalent, and in terms of the thermal content of fuels. Other tables show the estimated value of purchases of fuels, energy consumption by final users, and an analysis of energy consumption by main industrial groups. The section also contains charts showing the trends of primary fuel consumption and demand by final consumers of energy in graphical form. Other sections deal separately with individual fuels, prices and values of fuels, the finances of nationalized fuel industries, and foreign trade in fuels. Fuel production and consumption statistics are derived mainly from the records of fuel producers and suppliers and foreign trade statistics from returns made to HM Customs and Excise and published in the Overseas Trade Statistics of the United Kingdom. The geographical coverage of the statistics is indicated. (MCW)

UNCONVENTIONAL SOURCES AND POWER GENERATION

44897 (CONF-760688—, pp 3-29) **Prospects for energy from alternate sources in Canada.** Oosthuizen, P.H.; Rush, C.K. (Queen's Univ., Kingston, Ontario (Canada). Dept. of Mechanical Engineering). [nd].

From 16. annual meeting on control of reactor radiation fields; Toronto, Ontario, Canada (13 Jun 1976).

In Nuclear energy and society. Volume 3: nuclear energy and the public.

Alternate energy sources in Canada are examined. Wind power appears attractive in the Gulf of St. Lawrence area. Solar energy is appropriate for supplementary heat for housing. Social factors militate against high first cost installations.

44898 **Possibilities and principal features of the use of renewable resources in the FRG.** Kelleter, H.J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Programmgruppe Systemforschung und Technologische Entwicklung). pp 393-399 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 29: Wirtschaftliche Aspekte. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

Studies concerning the possibilites of various energy systems deal with the structure of future and present energy consumption. Those structure studies partially allow interesting conclusions for the renewable energy resources, too. Some examples of those results are given with especial emphasis on the local distributions. Current investigations which include time dependence and necessary temperature of consumption are listed.

SOLAR

REFER ALSO TO CITATION(S) 44347, 44348, 44402

ENERGY CONVERSION

MHD GENERATORS

44899 **Physics of MHD generators.** Nedospasov, A.V. (Institute of High Temperatures, USSR Academy of Sciences). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 10, 861-869(Oct 1977).

A brief popular review is presented of physical phenomena in MHD plasma generators of electric power. The interaction between a current of weakly ionized gas and a transverse magnetic field is described. Qualitative explanations are given of the leading instabilities of this current and of certain phenomena near the electrodes. The characteristic properties of the plasma in MHD generators with nonequilibrium conductivity are noted. They include ionization turbulence, motion of the ionization front through a weakly ionized gas, and its stabilization at entry into the MHD duct. Data characterizing the scientific and technological achievements in the development of MHD generators are cited.

DESIGN AND DEVELOPMENT

REFER ALSO TO CITATION(S) 44894, 44914

44900 (FE—2238-1) **Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1—June 30, 1976.** Cook, C.S.; Marston, C.H.; Dellinger, T.; Omori, S.; Zauderer, B.; DeDominicis, L.D.; Dickinson, K.; Davis, L.K.; Alyea, F.; Kennedy, A.J. (General Electric Co., Philadelphia, Pa. (USA). Space Sciences Lab.). Aug 1976. Contract EX-76-C-01-2238. 129p. Dep. NTIS, PC A07/MF A01.

Portions of document are illegible.

Work in progress at the General Electric Space Sciences Laboratory is directed toward assessing the feasibility of direct coal fired, closed cycle MHD energy conversion. Task I is an extension of OCR/GE work evaluating a fossil fuel fired ceramic regenerative heat exchanger and determining the purity of heated argon following energy transfer from a combustion gas heated ceramic matrix at 2800

F and 10 atma. Gas contaminant data are presented showing the scheme to be attractive. Task II involves the conversion of the heat exchanger facility to direct coal firing using a cyclone coal combustor. This involves the design of a combustor (3500 F, 1 to 8 atma), the modification of the current heat exchanger matrix (hole size, material) and the design of air and coal handling, storing, feeding, measurement and control systems. Additionally, hot blast valves and a diagnostic test section are being incorporated. Task III provides general analytical support in addition to addressing two separate areas. Non-equilibrium MHD generator analysis is being continued with emphasis on kinetic modeling and unsteady flow analysis. The closed cycle MHD power plant system is also under study. Results of ECAS are the basis for analysis of pressurized combustion, improved thermal and steam integration and other system aspects.

MATERIALS, COMPONENTS, AND AUXILIARIES

REFER ALSO TO CITATION(S) 44900

DUCT ENGINEERING AND FLUID DYNAMICS

REFER ALSO TO CITATION(S) 44132, 44900

44901 (CONF-770402—3) **Interelectrode arcs and electrical fluctuations in an MHD channel.** Kovbasyuk, V.I.; Baranov, N.N.; Iserov, A.D.; Klimovskii, I.I. (Department of Energy, Washington, D.C. (USA). Div. of Magnetohydrodynamics). Apr 1978. 37p. Dep. NTIS, PC A03/MF A01.

From The US-USSR Steering Committee for cooperation in MHD; Washington, DC, USA (13 Apr 1977).

In commercial scale MHD generators with induced high Hall voltages, the hazard of a breakdown between adjacent elements of the channel insulated from each other--such as electrodes, insulating modules and frames--becomes apparent. The breakdown causes an additional circulation of the current within the channel, a reduction of electrical power and may lead to the destruction of the structure. To design an MHD channel it is essential to understand the conditions in which a breakdown occurs. However, at the present time there is a lack of experimental data related to the breakdown phenomena in the induced electrical field of a full-scale MHD channel. Therefore, at the U-25 facility a number of studies were directed at the conditions in which a Hall breakdown appears including the monitoring of electrical fluctuations in the channel. The data presented demonstrates the experimental results of these studies in an induced electrical field.

44902 (CONF-780336—1) **Two-phase liquid-metal MHD generator experiments and pressure-gradient correlations.** Dunn, P.F.; Fabris, G.; Pierson, E.S.; Petrick, M. (Argonne National Lab., Ill. (USA)). 1978. Contract W-31-109-ENG-38. 13p. Dep. NTIS, PC A02/MF A01.

From 2. seminar on MHD flows and turbulence; Beer-Sheva, Israel (28 Mar 1978).

The experimental results obtained from both single- and two-phase liquid-metal MHD studies conducted at two ANL facilities utilizing both circular and rectangular test-section geometries are presented. Single-phase pressure gradient data for the circular geometry are compared with existing MHD theory, and the two-phase results for both geometries are found to agree well with a two-phase MHD correlation developed herein.

44903 (N—77-33468) **Theoretical and experimental investigations on shock waves in gas-solid flows.** Deeg, H.J. (Technische Univ. Berlin (Germany, F.R.)). 1976. 129p. (ILR—18). NTIS PC A07/MF A01.

As part of a liquid metal-magnetohydrodynamic conversion program, shock waves in gas-solid flows, consisting of air and glass particles, were investigated theoretically and experimentally. A flow mechanical model for supercritical gas-solid flows was developed. The model was used to investigate the influence of the supercritical flow condition in front of the shock wave and the influence of the particle size on the change of the flow condition within a shock wave. Equipment to generate and measure shock waves in an air-glass particle flow was developed. Theory and experiments were compared and proposals for improvement of the flow model made.

THERMOELECTRIC GENERATORS

DESIGN AND DEVELOPMENT

44904 **Thermo-electric generators.** Jones, I.W. (to Chloride Silent Power Ltd.). US Patent 4,042,757. 16 Aug 1977. Priority date 10 Apr 1975, United Kingdom of Great Britain and Northern Ireland (UK). 10p.

A thermo-electric generator of the kind making use of beta alumina ceramic through which sodium is circulated to produce an electric potential between the two surfaces of the ceramic has the ceramic in the form of a tube closed at its upper end and with its open end extending into liquid sodium. A heat pipe extends into the ceramic tube and there is an external tubular casing around the ceramic tube forming a closed structure for housing sodium in liquid and vapor form both inside and outside the ceramic tube. The heat pipe may be arranged either as a heat source or heat sink for the sodium inside the ceramic tube, the housing forming the heat sink in the former case of the heat source in the latter. The ceramic tube may, at its open end, be sealed to the housing and a pump used for pumping the sodium from the cold face to the hot face of the ceramic or capillary means may be used to circulate the sodium.

THERMIONIC CONVERTERS

PERFORMANCE AND TESTING

44905 **Cesium—bismuth thermionic converter.** Gverdtsiteli, I.G.; Kalandarishvili, A.G.; Kashiya, V.G. *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 495-496(Nov 1977).

The current-voltage characteristics and the specific power of a Cs-Bi thermionic converter were measured as functions of the resevoir temperature and stoichiometric composition.

44906 **Current-density distribution in a long cylindrical thermionic converter.** Volkov, A.D.; Lukovenko, V.I.; Shorina, L.M.; Shcherbinin, P.P. *Sov. Phys. - Tech. Phys. (Engl. Transl.);* **22**: No. 10, 1217-1221(Oct 1977).

The current-density distribution in a long (180-mm) cylindrical diode with a multisection anode is studied. The anode consists of 12 sections, each 15 mm long. The insulation between sections is a sheet of synthetic mica 0.1 μm thick. The electrode separation in the cold state is 0.4 mm. The local distributions of the temperature, the current, and the voltage along the diode are found at various points of the current—voltage characteristic over the temperature range 1400—1800 °K and at pressures p=0.6 +- 0.1 torr. These distributions do not verify the principle of additivity of voltage—current characteristics. The inhomogeneity found in the current profile of the diode remains qualitatively the same as the deviation from an isothermal electrode profile is changed, as the cathode temperature is changed over the interval 1400< or =T/sub k/ < or =1700 °K, and as the boundary conditions are changed (as some of the anode sections are turned off). This inhomogeneity remains constant in time and is characterized by a scale dimension of the order of the length of a section. A qualitative change in the current profile appears at a cathode temperature T/sub k/=1800 °K. The scale length of the inhomogeneity increases to half the dimension of the diode. At a cathode temperature T/sub k/≅1500 °K the current profile remains qualitatively the same as the cesium vapor pressure is varied over the range p=0.31—1.8 torr. At T/sub k/≅1800 °K there is a qualitative change in the current profile as the pressure is varied over the range p=0.55—2.7 torr. As the length of the diode is reduced (and some of the anode sections are disconnected) at a constant temperature and a constant voltage, the current density at the working sections increases.

FUEL CELLS

DESIGN AND DEVELOPMENT

44907 (N—77-33605) **Solid polymer electrolyte (SPE) fuel cell technology program, phase 1/1a. Final report.** (General Electric Co., Wilmington, Mass. (USA). Aircraft Equipment Div.). 17 Oct 1975. Contract NAS9-14345. 92p. (NASA-CR—151506; TPR—015). NTIS PC A05/MF A01.

A solid polymer electrolyte fuel cell was studied for the purpose of improving the characteristics of the technology. Several facets were evaluated, namely: (1) reduced fuel cell costs; (2) reduced fuel cell weight; (3) improved fuel cell efficiency; and (4) increased systems compatibility. Demonstrated advances were incorporated into a full scale hardware design. A single cell unit was fabricated. A substantial degree of success was demonstrated.

44908 (N—77-33608) **Redox bulk energy storage system study. Volume 1. Final report, 18 February 1976—30 January 1977.** Ciprios, G.; Erskine, W. Jr; Grimes, P.G. (Exxon Research and Engineering Co., Linden, N.J. (USA). Government Research Lab.). 10 Feb 1977. Contract NAS3-19776. 200p. (NASA-CR—135206(Vol.1); EXXON/GRU—1BH-77(Vol.1)). NTIS PC A09/MF A01.

Opportunities were found for electrochemical energy storage devices in the U.S. electric utility industry. Application requirements for these devices were defined, including techno-economic factors. A new device, the Redox storage battery was analyzed. The Redox battery features a decoupling of energy storage and power conversion functions. General computer methods were developed to simu-

late Redox system operations. These studies showed that the Redox system is potentially attractive if certain performance goals can be achieved. Pathways for reducing the cost of the Redox system were identified.

44909 (N—77-33609) **Redox bulk energy storage system study. Volume 2. Final report, 18 February 1976—30 January 1977.** Ciprios, G.; Erskine, W. Jr; Grimes, P.G. (Exxon Research and Engineering Co., Linden, N.J. (USA). Government Research Lab.). 10 Feb 1977. Contract NAS3-19776. 549p. (NASA-CR—135206(Vol.2); EXXON/GRU—2BH.77(Vol.2)). NTIS PC A23/MF A01.

Opportunities were found for electrochemical energy stoage devices in the U.S. electric utility industry. Application requirements for these devices were defined, including techno-economic factors. A new device, the Redox storage battery was analyzed. The Recox batter features a decoupling of energy storage and power conversion functions. General computer methods were developed to simulate Redox system operations. These studies showed that the Redox system is potentially attractive if certain performance goals can be achieved. Pathways for reduding the cost of the Redox system were identified.

44910 **Method of operating a fuel cell.** Zito, R. Jr.; Kunz, L.J. Jr. (to GEL, Inc.). US Patent 4,053,684. 11 Oct 1977. Filed date 11 Nov 1976. 6p.

A fuel cell is described comprising anolyte and catholyte compartments separated by a diffusion barrier and using sodium sulfide aqueous solution as anolyte and an aqueous catholyte solution. The apparatus is controlled to maintain a positive pressure differential across the anolyte/catholyte interface in the barrier towards the anolyte side to attenuate sulfide ion migration to the catholyte and reduce solid sulfur precipitation in the catholyte and thereby attenuate consequent cathode passivation or other forms of catholyte compartment poisoning.

44911 **Method and apparatus for electrochemical generation of power from hydrogen.** Anbar, M. US Patent 4,042,755. 16 Aug 1977. Filed date 10 Nov 1975. 6p.

Method and apparatus are described for the pollution-free generation of electrical power from hydrogen in which molten lead is electrochemically oxidized to produce lead oxide and electricity in a single cell in which the resulting lead oxide is simultaneously converted back to lead metal by thermochemical reduction with hydrogen fuel. The entire process is carried out in a single cell using a molten salt as electrolyte in a temperature range of 500° to 900°C. The entire cycle consumes only hydrogen and oxygen, while producing electricity.

44912 **Pressurized high temperature fuel cell power plant with bottoming cycle.** Van Dine, L.L. (to United Technologies Corp.). US Patent 4,041,210. 9 Aug 1977. Filed date 30 Aug 1976. 12p.

A power plant for the generation of electricity utilizes high temperature fuel cells, such as molten carbonate fuel cells, as its main power supply. Part of the oxidant exhaust stream from the fuel cell is recycled through the fuel cell. Waste energy from the fuel cell in the form of exhaust gases, such as part of the oxidant exhaust, drives a turbocharger for compressing the oxidant used in the fuel cell. In a preferred embodiment the oxidant exhaust also is the source of energy for powering a bottoming cycle, such as a steam driven turbogenerator. Power plant efficiency is improved by making maximum use of the energy and heat generated within the system.

PERFORMANCE AND TESTING

44913 (N—77-33606) **Solid polymer electrolyte (SPE) fuel cell technology program, phase 2/2a. Final report.** (General Electric Co., Wilmington, Mass. (USA). Aircraft Equipment Div.). 15 Dec 1976. Contract NAS9-14345. 96p. (NASA-CR—151507; TPR—028-4). NTIS PC A05/MF A01.

Test evaluations were performed on a fabricated single solid polymer electrolyte cell unit. The cell operated at increased current density and at higher performance levels. This improved performance was obtained through a combination of increased temperature, increased reactant pressures, improved activation techniques and improved thermal control over the baseline cell configuration. The cell demonstrated a higher acid content membrane which resulted in increased performance. Reduced catalyst loading and low cost membrane development showed encouraging results.

MATERIALS, COMPONENTS, AND AUXILIARIES

44914 **Method for preparing fuel cell catalysts.** McNicol, B.D.; Short, R.T. (to Shell Oil Co.). US Patent 4,081,409. 28 Mar 1978. Priority date 20 Feb 1976, United Kingdom of Great Britain and Northern Ireland (UK). 4p.

A catalyst for a fuel cell electrode having improved activity is prepared by covering a Group VIII transition metal with oxygen during or before immersion in a liquid containing a compound of a co-catalyst.

ELECTROMECHANICAL CONVERTERS

44915 **Electrical response of relaxing dielectrics compressed by shock waves: The axial-mode problem.** Lysne, P.C. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 7, 4180-4185(Jul 1978).

Axial-mode conditions occur in studies of the dielectric properties of materials compressed by shock waves whenever the electrical vectors are perpendicular to a planar shock front. These conditions are readily obtained in shock experiments, and the analysis of the experiments is one dimensional. This work considers the electrical response of shock-wave-compressed dielectrics and piezoelectrics where changes in the polarization due to imposed electric fields do not occur instantaneously with field changes. Experiments are proposed in which the effective impedance shunting the specimen is either negligible or a series inductive-resistive network. These latter experiments are useful in discriminating between dielectric relaxation and other relaxation phenomena. Several example problems are solved, and they suggest profitable areas of future work.

ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

44916 (PB—274075) **Energy consumption in North Carolina, 1975 and 1976.** (North Carolina Dept. of Commerce, Raleigh (USA). Energy Div.). Apr 1977. 17p. NTIS PC A02/MF A01.

A partial listing of contents includes: Gross fuel consumption in North Carolina, 1975; Comparison of Percentage consumption by fuel types for North Carolina and the United States for 1975; Comparison of percentage consumption by economic sectors for North Carolina and the United States for 1975; Gross fuel consumption in North Carolina, 1976; Percentage changes in gross fuel consumption in North Carolina, 1975-1976; Energy flow in North Carolina, 1976.

44917 **Suggestion for the definition and term limitation in the environment and waste heat utilisation.** Schaefer, H.; Ebersbach, K.F.; Geiger, B.; Piller, W.; Rudolph, M.; Wolff, U. *Brennst.-Waerme-Kraft;* **29**: No. 12, 479-481(Dec 1977). (In German).

The article suggests discussion terms which should make it possible to arrive at an uniform and systematic consideration of energy processes. The aspects of waste heat utilisation, in particular, are investigated. The following terms have been given special attention: target energy, input energy, added energy, ambient energy, waste energy, progressive energy, environment energy, waste heat utilisation, environment heat utilization, and return energy.

44918 **Alternative paths of energy supply - physical-chemical contributions.** Vielstich, W. (Bonn Univ. (Germany, F.R.)). *Chem. Unserer Zeit;* **11**: No. 6, 131-141(Oct 1977). (In German).

A survey is given on the primary energy demand in the world, the EC, and the Federal Republic, on natural oil, natural gas and coal as energy carriers, on energy from nuclear fission and fusion, on the ^{235}U LWR reactor, uranium energy from breeder reactors energy recovery from fusion and solar radiation. Energy storage and transport according to the hydrogen economy and coal liquefaction are discussed as alternatives.

44919 **Development of primary energy consumption since 1860.** Hildebrandt, R. (Bergbau-Forschung G.m.b.H., Essen (Germany, F.R.)). *CZ-Chem.-Tech.;* **6**: No. 8, 327-328(Aug 1977). (In German).

2 figs.; 1 ref. Also published in Primaerenergie, Elektrische Energie by Schilling, H.D. and Hildebrandt, R. (1977). Short communication only.

44920 **Primary energy consumption rose in 1976 to some 371 million t CE. Electricity generation target 'more or less reached' in 1976.** *Sanit. - Heizungstech.;* **42**: No. 4, 342(1977). (In German).

BUILDINGS

REFER ALSO TO CITATION(S) 44871

44921 (AD-A—048734) **The building loads analysis and system thermodynamics (BLAST) program. Volume I. User's manual. Final report.** Hittle, D.C. (Army Construction Engineering Research Lab.,

Champaign, Ill. (USA)). Dec 1977. 170p. (CERL-TR-E—119-VOL-1).

The Building Loads Analysis and System Thermodynamics (BLAST) program is a comprehensive set of subprograms for predicting energy consumption in buildings. There are three major subprograms: (1) the space load predicting subprogram, which computes hourly space loads in a building or zone based on user input and hourly weather data; (2) the air distribution system simulation subprogram, which uses the computed space load and user inputs describing the building air-handling system to calculate hot water or steam, chilled water, and electric energy demands; and (3) the central plant simulation program, which simulates boilers, chillers, on-site power generating equipment and solar energy systems and computes monthly and annual fuel and electrical power consumption and plant life cycle cost. The program is written in FORTRAN Extended, Version 4, and can be used on CDC 6000/7000 series computers with few or no modifications. Volume 1 of this report provides detailed user instructions, and Volume II contains detailed flowcharts and algorithm descriptions of the program.

44922 (AED-Conf—1977-072-007) **Experiences with heat recovery from waste water.** Fischer, M. (Bayerische Elektrizitaets, Muenchen (Germany, F.R.)). 1977. 11p. (In German). Dep. NTIS (US Sales Only), PC A02/MF A01.

Experiences gained in the operation of a heat pump using waste water from automatic film developers are reported. The developers use tap water heated to 25°C for washing and the waste water then becomes a possible heat source for a heat pump. Corrosion problems had to be considered in the design of the system. The economics of the system is compared with gas heating. In almost two years of operation the system has presented no problems. (JSR)

44923 (CONF-761220—, pp 149) **New energy conservation ideas for existing and new buildings.** Dubin, F.S. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

44924 (CONF-761220—, pp 151-156) **Energy conservation studies for new and existing buildings produce guidelines and standards-tools for decision making.** Dubin, F.S. 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

Three energy conservation studies for the government and one for a corporation conducted by Dubin-Mindell-Bloome Associates and the elements of several subsequent projects involving energy conservation studies and/or designs performed by the firm specifically to conserve energy in buildings are described. These studies are described briefly and the energy options open to us are listed. Conclusions are drawn about the value of energy conservation studies. (MHR)

44925 (LBL—7812) **Discussion of heat mirror film: performance, production process, and cost estimates.** Levin, B.P.; Schumacher, P.E. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). 4 Oct 1977. 84p. Dep. NTIS, PC A05/MF A01.

Intrex film is a unique, transparent, electrically conductive plastic film originally developed as a component in electrically heatable, transparent products such as de-icing windshields for aircraft, locomotives, and the like. The electrical conductivity is imparted to the plastic film by the vacuum deposition of a thin film of gold onto one surface. This gold film exhibits typical luminous transmittance of 80% and sheet resistivity of 10 ohms per square. The free electron concentration in the gold film that permits such high electrical conductivity is also responsible for very high reflectance and low emittance of electromagnetic radiation in the near and middle infrared spectral regions. For this reason, the Intrex film can be regarded as a "heat mirror" with possible application as a glazing cover interior to a conventional window where it serves to reflect low temperature, long wavelength radiation back into the interior of the heated space or prevent its radiation outward. Since the chief utility of such a heat mirror film is during the heating season, a high luminous transmittance, or more precisely a high solar transmittance, is essential to ensure the benefits of solar heat gain. The properties, heat mirror performance, production and cost of Intrex film for window coating were studied. Intrex film was found to have optical properties which make it suitable for heat mirror window applications when used as the interior component of double layer glazing. The cost of the film in various quantities has been demonstrated to be low enough to make such heat mirrors economical. Possible modifications of Intrex films to improve heat mirror performance are discussed. Several alternate approaches for lower cost heat mirror windows are explored, including other metals, semiconducting oxides and multilayer polymers. Abrasion-corrosion resistant coatings for Intrex and their effect on heat mirror performance are also discussed. (LCL)

44926 (SAI—77-858-LJ) **Energy efficiency program for room air conditioners, central air conditioners, dehumidifiers, and heat pumps.** (Science Applications, Inc., La Jolla, Calif. (USA)). Mar 1978. Contract EM-76-C-01-8648. 427p. Dep. NTIS, PC A19/MF A01.

The Energy Policy and Conservation Act (EPCA) mandates energy efficiency programs for many household appliances including room air conditioners (RAC), central air conditioners (CAC), dehumidifiers (DH) and heat pumps (HP). A program for these four appliances was undertaken to: obtain baseline data for all categories of products by test, market survey, or otherwise, as appropriate; determine technologically feasible levels for energy efficiency improvement targets (EEITs) for 1980; and evaluate the economic impacts associated with the technologically feasible EEITs. The procedures for and results of testing, analytically modeling, and analyzing the performance of these appliances and of determining the economic impact of proposed efficiency improvements are discussed. It is concluded that there is no basis for indicating that RAC, CAC, and HP efficiencies could or should be increased beyond the higher levels represented in today's market. Conversely, it does appear that today's lower efficiency products can be improved to higher levels of efficiency with little purchase price impact on the consumer. The greatest energy savings are achieved by increasing the efficiency of the lowest EER/COP products, and the purchase price impacts are the smallest for such changes. Most of the economic impact analyses indicated very little cost impact for increasing EERs to 7.5 or 8.5 depending on the product category. The data for DHs are so limited that it is exceptionally difficult to determine how efficient they might be, and at what cost. It appears that energy consumption is not a major consideration in DH design, with possibly a few exceptions. (LCL)

44927 (UCRL-Trans—1548) **Influence of tightening of the windows on the condensation and the heat economy.** Railio, J. (Valtion Teknillinen Tutkimuskeskus, Helsinki (Finland)). Jan 1978. Translation of Finnish report. 16p. Dep. NTIS, PC A02/MF A01.

The effects of tightening storm windows and inner windows on heat losses and window pane condensation in buildings in Finland with various heating and ventilating systems are discussed. (LCL)

44928 **Mixed control for radiators.** Lang, C. *Gesund.-Ing.;* **98**: No. 12, 340-342(Dec 1977). (In German).

Instead of the usual way to control heat emission from radiators by using throttle valves, water temperature is controlled here by individual mixing before entering the radiator. Evading the heat generator, part of the water is led to the mixing lines via a backflow line. Essential advantages are: (1) the volume flow is hardly changed by the radiators, thus keeping the temperature constant over the whole radiation surface; and (2) the control for rooms with highly differing heat demand is much easier.

44929 **Water and heat recycling.** *Oel- Gasfeuerung;* **22**: No. 4, 211(1977). (In German).

44930 **Daylight loading through protection against the Sun.** Daniels, K.; Bartenbach, C. *Tech. Bau;* **8**: No. 3, 291-294(1977). (In German).

Customary types of protection against the sun which normally reduce the amount of light in office and working rooms can increase the costs for lighting. An ideal protection against the sun with high thermal reflection or thermal absorption which ensures good light permeability is the optical prism system. Combined put-up and built-in optical systems are discussed. Additional investments for optical protection against the sun under the aspect of reduced plant and energy costs for air-conditioning and lighting are considered.

44931 **Heat production and distribution in buildings with solar energy and heat pumps.** Raetz, K.; Bofinger, H. *Tech. Bau;* **8**: No. 3, 267-269(1977). (In German).

Types of solar collectors efficiency independent of construction and insolation are described. The efficiencies of compressors and Stirling-type heat pumps are given. Constructive and engineering measures with the target of dispensing with fossil or electric auxiliary heatings in solar-heated systems are discussed. Broad applications of the heat pump principle with outside air as a heat souce and with stirling-type heat pumps, are described.

44932 **Building design with regard to energy conservation.** Breustedt, W. pp 365-374 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 28: Baurecht und Siedlungsplanung. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

The opportunities for saving energy in (room) heating costs are viewed now, primarily, under the aspect of HVAC installation methods. One does not, however, regard the interrelationship between the size of the building, its 'skin' type, the building orientation,

regional climate and the heating system. The systematical approach to energy conservation methods in the field of physics shows that comprehensive building design still has the potential to lower energy consumption and, at the same time, leaves scope for applying technology that is not yet ready for general marketing.

44933 Energy engineer - a profession of the near future. Kleine, F. (Arbeitsgemeinschaft Industriebau e.V., Koeln (Germany, F.R.)). pp 549-562 of 1. Deutsches Sonnenforum. Bd. 3. Tagungsbericht. Kapitel 32: Neue Berufsbilder. Bossel, U. (ed.). Muenchen, Germany, F.R.; DGS (1977). (In German)

From 1. German solar forum with exhibition; Hamburg, Germany, F.R. (23 - 28 Sep 1977).

In the near future, energy-management will become a fast-expanding field. Only experts in energy-management can move quickly and with sure professionalism, in the exact science of selecting the most cost-effective means of using energy, of trade-offs to optimize fuels, equipment and possibilities of energy conservation in buildings.

44934 Energy conservation: chance for low-temperature systems. *Sanit. - Heizungstech.;* **42**: No. 4, 324-325(1977). (In German).

A report is given on research work 'Effects of technique and modes of behavior on energy consumption', carried out by Dornier System and Fichtner, Consulting Engineers, on behalf of the Federal Ministry for Research and Technology Criteria of assessment for the comparison of the heating systems conventional radiator heating 90/70°C, radiant panel or floor heating with low temperature 50°C, hot-air heating.

44935 Economic significance of the use of electric heat. Tiberghien, E. (Societe de Traction et d'Electricite, Brussels (Belgium)); Dijck, G. van (Brussels Univ. (Belgium)). *Elektro-Anz.;* **29**: No. 21, 503-506(1976). (In German).

This article contains the major paragraphs of the chapter 'Economic significance of the use of electric heat' written by the authors mentioned above in their book: 'Electric heat - theory and practice', Publishing Company Girardet, Essen, FRG. Starting from the development of the use of electric heat, general economic aspects, properties of energy sources, technical advantages, improved work hygiene as well as conditions and advantages derived from the properties of materials involved are dealt with, and the economic balance is struck.

44936 (UCRL-Trans—1549) Possibilities of improving the heat insulation of the windows. Railio, J. Translated from *Rakennustekniikka;* No. 6, 523-526(1976). 10p. Dep. NTIS, MF A01.

Portions of document are illegible.

The k-value of windows can be substantially improved in various ways, i.e., fixed (compact) and adjustable methods. Of the fixed improvements, the most promising are coatings which, as they decrease the radiation, are able to improve the k-value to a greater extent than is the case when the amount of glass is increased. The effect of the coating can be improved by the filled gas, which decreases the convection. Thus, the heat loss is decreased to approximately 60 to 70% while the penetration of light still remains the same. The best adjustable improvements are venetian blinds and rolling blinds placed in the air space, the surfaces of which reflect heat. Noticeable energy savings can also be reached with the aid of air conditioned windows (fresh air window, exhaust air window etc.,). Only the k-value of the outgoing heat transfer was examined. However, the window is also effective in the opposite direction: radiation from the sun brings considerable amount of heat inside even during the winter months, especially windows facing the south. This decreases considerably the net heat loss of the window. The base of the improvement of the k-value of the window, however, does not drop, as several improvements allow a considerable amount of the radiation energy to come in. The problem of improving the window was examined as a whole, i.e., in the computations the changes in the outgoing as well as the incoming energy was taken into consideration.

RESIDENTIAL BUILDINGS

44937 (CONF-761220—, pp 263-266) Cooling of low cost houses in North-East Brasil. Cheema, L.S. (Cidade Universitaria, Brasil). 1976.

From Solar cooling and heating forum; Miami Beach, FL, USA (13 Dec 1976).

In Solar cooling and heating: a national forum.

An evaporative cooling system designed for low-income housing in Brazil is described. The roof is constructed of semi-circular one cm thick porous ceramic tiles. The roof has alternate rows of top and bottom tiles. The water flows from a roof-mounted tank to a plastic pipe and then oozes out along each row of the bottom tiles through strings fixed to the pipe with epoxy. (MHR)

44938 (LBL—7817) Design of a mobile laboratory for ventilation studies and indoor air pollution monitoring. Berk, J.V.; Hollowell, C.D.; Lin, C.I.; Pepper, J.H. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Apr 1978. Contract W-7405-ENG-48. 54p. Dep. NTIS, PC A04/MF A01.

The design and fabrication of a mobile laboratory for research and development studies of ventilation requirements and energy utilization in residential and commercial buildings are described. Functionality, flexibility, and versatility have been stressed without sacrificing appearance and operator convenience. It is believed that modifications of and additions to the mobile laboratory (such as adding the capability to monitor building energy flow) can be made with a minimum of inconvenience. The studies being performed will provide data needed for the establishment of energy efficient ventilation standards.

44939 (N—77-34050) Preliminary design study of a baseline MIUS. Wolfer, B.M.; Shields, V.E.; Rippey, J.O.; Roberts, H.L.; Wadle, R.C. (National Aeronautics and Space Administration, Houston, Tex. (USA). Lyndon B. Johnson Space Center). Apr 1977. 262p. (NASA-TM-X—58193; JSC—11625). NTIS PC A12/MF A01.

Results of a conceptual design study to establish a baseline design for a modular integrated utility system (MIUS) are presented. The system concept developed a basis for evaluating possible projects to demonstrate a MIUS. For the baseline study, climate conditions for the Washington, D.C., area were used. The baseline design is for a high-density apartment complex of 496 dwelling units with a planned full occupancy of approximately 1200 residents. Environmental considerations and regulations for the MIUS installation are discussed. Detailed cost data for the baseline MIUS are given together with those for design and operating variations under cliamte conditions typified by Las Vegas, Nevada, Houston, Texas, and Minneapolis, Minnesota. In addition, results of an investigation of size variation effects, for 300- and 1000-unit apartment complexes, are presented. Only conceptual aspects of the design are discussed. Results regarding energy savings and costs are intended only as trend information and for use in relative comparisons. Alternate heating, ventilation, and air conditioning concepts are considered in the appendix.

44940 (NP—23142) Annual heating energy demand of heavy domestic buildings. Report No. 16. Leslie, S.F. (Building Research Association of New Zealand (Inc.)). Nov 1976. 25p. Dep. NTIS (US Sales Only), PC A02/MF A01.

The annual heating energy requirement of dwellings of the same plan and fenestration are calculated for four New Zealand climates under continuous and intermittent heating regimes. Five of the dwellings are of heavy construction, three are of light construction and all possess a concrete slab floor in intimate contact with the ground. Analysis of the heating requirements demonstrates that the major factors controlling annual space heating requirements of both lightweight and heavyweight buildings are climatic severity, thermal insulation amount and scheme, and heating regime. The principal findings concerning the inter-relationships between thermal capacitance, thermal insulation and heating regime are: the effects of thermal capacitance can result in an annual heating energy requirement larger or smaller by a factor of 20% than would be obtained by excluding these effects; the effects of thermal capacitance are strongly coupled to the effects of heating regime; the effects of thermal capacitance in the ground and floor are much greater than those of the thermal capacitance of the walls and roof; and when heating heavy dwellings continuously external insulation offers an energy saving over internal insulation while when heating intermittently internal insulation provides the saving. Finally, the frequency distribution of indoor and outdoor temperatures are examined for monthly intervals in the winter.

44941 Fireplace closure and safety device. Rule, A.O.; Bartley, W.E. (to Integrated Development and Manufacturing Co.). US Patent 4,084,570. 18 Apr 1978. Filed date 10 Sep 1976. 4p.

A fireplace closure device having both safety and decorative features is provided for mounting on the front of various sized masonry fireplaces. Fundamentally, the device comprises a plurality of laterally hinged slats with tapered pins being provided to hold the slats against the frame when closed such that the fireplace opening is sealed. A storage box, integral with the closure device frame, is included to store the hinged slats in such a manner as to permit use of the fireplace when the device is stored without obstructing the view from the adjacent living space or interfering with the addition of combustible materials to the fire or the use of common fireplace tools.

44942 Folding principle and the simulation of the dynamic thermal spatial behavior. Pt. 2. Jahn, A. (Technische Univ. Berlin (Germany, F.R.). Hermann-Rietschel-Institut fuer Heizungs- und Klimatechnik). *Gesund.-Ing.;* **98**: No. 12, 342-352(Dec 1977). (In German).

The calculations apply to a test room with the geometrical dimensions stated in VDI regulation No. 2078 - cooling load regula-

tions. With regard to the thermal storage capacity, 4 constructional variants of the room and two different window areas are studied. It is shown that heating/cooling load, air temperature and 'felt' temperature can be reliably calculated using the folding product if the heat transport behaviour of the room is known.

44943 Effects of heat leaks on thermal insulation of domestic and industrial buildings. Achtziger, J. (Forschungsinstitut fuer Waermeschutz e.V., Muenchen (Germany, F.R.)). *Gesund.-Ing.;* **98**: No. 12, 353-359(Dec 1977). (In German).

The second part reports findings of comparative experiments, window constructions with aluminium frames, ceilings made of prefabricated wooden elements, concrete sandwich elements, elements from naval construction, and refrigerator doors.

44944 (NP-tr—2012) **Air/water heat pump.** Clement, R. Translated from *Bull. Schweiz. Elektrotech. Ver.;* **68**: No. 4, 181-182(19 Feb 1977). 4p. Dep. NTIS (US Sales Only), PC A02/MF A01.

The feasibility of using a dual heating system for Swiss buildings was studied. This system includes a heat pump operating alone when outside temperatures are above 0°C and operating simultaneously with an oil burning system during low temperature periods. A house was retrofitted with the dual system and the system performance was monitored. It was found that the heat pump alone can supply between 60 to 70% of the building heating requirements, that when operating in conjunction with the oil heater the heat pump met up to 95% of the heating needs; and that retrofitting old buildings with this heating system was feasible. (LCL)

44945 Planning a bivalent heating system for heating a one-family house. Wieland, J. *Haustech. Rundsch.;* **76**: No. 4, 262-266(1977). (In German).

A heating plant with central water heating for a detached on-family house is described. The system makes use of solar energy with roof collectors geothermal heat with a pipe network of an overall length of 800 m, and a heat pump for the production of thermal heat in the low-tariff period. Operating time is minimized by using several stores. The hot-water floor heating system is described, and a basis of calculation and circuit diagram are given.

OFFICE BUILDINGS

REFER ALSO TO CITATION(S) 44403

44946 (PB—273949) **Estimating the energy conservation potential of ventilation control through weather data analysis. Final report.** Kusuda, T.; Bean, J.W. (National Bureau of Standards, Washington, D.C. (USA)). Aug 1977. 52p. (NBSIR—76-1088). NTIS PC A04/MF A01.

Hourly weather data for six selected cities in the United States covering eleven consecutive years were analyzed to aid in estimating the possible energy saving that could be achieved by closing the outdoor dampers during unoccupied hours. Hourly temperature and enthalpy values are presented in histogram form for occupied and unoccupied periods (office use), with the suggestion that similar data processing be carried out for other cities as well.

SCHOOL, MUNICIPAL AND OTHER PUBLIC BUILDINGS

44947 (AD-A—048324) **Building heating energy consumption at fixed facilities. Final report, April—June 1977.** Botros, M.M. (Army Facilities Engineering Support Agency, Fort Belvoir, Va. (USA). Research and Technology Div.). 20 Jun 1977. 127p. (USAFESA-RT—2034). NTIS PC A07/MF A01.

Oil delivery data were collected for twenty-four building types at three Army installations in the Washington, DC area. These data, collected for FY 75 and FY 76, were analyzed to determine the heating energy consumed by the different building types. The average heating energy consumption as well as the high and low samples were calculated and plotted for each building type. The report provides a basis for determining where the application of energy conservation techniques and the use of energy control systems is most cost effective.

44948 (PB—274285) **Report on the development of a model energy conservation program for New York State schools. Report on phase 1, January—July 77.** Green, A.C.; Boice, J.R.; Burns, J.A.; Bedford, S. (Educational Facilities Labs., Inc., New York (USA)). 23 Nov 1977. 94p. NTIS PC A05/MF A01.

All school buildings (158) in twenty-two of New York State's seven hundred thirty school districts were analyzed in terms of energy use and conservation potential. This was done first with GAP2 (Guideline Analysis Program) adjusted to New York State standards, and then with CIP2 (Capital Improvements Program).

COMMERCIAL AND INDUSTRIAL BUILDINGS

REFER ALSO TO CITATION(S) 44922, 44938

44949 Economy of ventilators in plants with variable volume flow. Rasmussen, K.N.; Schmidt, H.; Bentsen, J. *Gesund.-Ing.;* **98**: No. 12, 333-339(Dec 1977). (In German).

Under the aspect of rational energy utilisation, it is important to choose the right type of ventilator with regard to operational economy and safety when dimensioning ventilation systems. In particular, the paper deals with the economics of systems with variable amounts of air.

44950 Illumination also needs energy. Measures for rational and economical uses of illumination energy. Gnugesser, E.; Kopp, K. (Kraftanlagen A.G., Heidelberg (Germany, F.R.)). *Elektr. Energ. Tech.;* **22**: No. 4, 175-177(Aug 1977). (In German).

The power supply for illumination amounts to 20-25% of the total power demand in the Federal Republic of Germany. In modern lights, maximally 20% of the power used is converted to light radiation, the major part is carried into the room as heat. The heat demand can be reduced considerably by reasonable arrangement of the light waste heat into the ventilation system with heat recovery which is already existing in large rooms. In the summertime, sucking off the light waste heat in so-called air-condition-lights leads to reduction of the cooling power. With progressing interconnection of the energy flows (for heating, cooling, air transport, and illumination) in the technical equipment of the building, energy consumption for illumination can amount to up to 70% of the total external energy consumption.

TRANSPORTATION

AIR AND AEROSPACE

44951 (PB—274586) **Analysis of fuel conservation through aircraft towing. Technical report.** Sinha, A.N. (Mitre Corp., McLean, Va. (USA). METREK Div.). Feb 1975. Contract DOT-FA70WA-2448. 43p. (MTR—6790). NTIS PC A03/MF A01.

An analysis of aircraft towing at the top twenty air carrier airports in the United States is presented. The study of towing aircraft analyzes the economic feasibility of two towing scenarios: towing arrivals and departures, towing departures only. The analysis has been conducted under assumptions which yield an upper bound (high estimates) of fuel savings and a lower bound (low estimates) of the costs involved. A number of operational factors which would reduce the fuel savings and further increase the cost of towing have been identified but not explicitly accounted for in the analysis. The environmental benefits (noise and pollution reduction) of aircraft towing have not been considered in this analysis. This analysis indicates that no towing scheme is economically feasible unless the price of fuel increases by at least 150 to 200% more (over 1974 prices) without any increase in crew costs. If, however, future conditions require that fuel be conserved at all costs, then towing schemes would yield a savings of 0.7 to 1.3% of the total air carrier fuel usage at an additional net annual cost of 21 to $90 million.

LAND AND ROADWAY

REFER ALSO TO CITATION(S) 44873

44952 (HCP/M6037—01) **Fuel economy of automotive vehicles: a compendium of statistical techniques.** McAdams, H.T. (Falcon Research and Development Co., Buffalo, N.Y. (USA)). Nov 1977. 108p. Dep. NTIS, PC A06/MF A01.

Nine working papers are presented as the result of a study to develop a statistical methodology and formulation of specific statistical procedures for the analysis of in-use automobile fuel-economy data. Topics covered are: (1) variance computed relative to the harmonic mean; (2) bases for statistical estimation of fuel economy; (3) estimating the standard error for a sample harmonic mean; (4) the effect of accumulated odometer miles on mpg shortfalls; (5) aggregation of data from sources with groups of "replicate" vehicles; (6) philosophical and analytic issues affecting the FEA fuel-economy study; (7) a regression/covariance analysis approach to estimation of fuel economy; (8) vehicle ranking according to fuel economy; and (9) a regression approach to vehicle ranking. (PMA)

SEA AND WATER

44953 (PB—275722) **Maritime fuel conservation.** Lewis, E.V.; Femenia, J.; Zubaly, R.B. (Webb Inst. of Naval Architecture, Glen Cove, N.Y. (USA)). Jul 1977. Contract MA-2-4321. 203p. NTIS PC A10/MF A01.

This report is the result of a three year survey of means for fuel conservation in the maritime industry. Topics covered include ship operational practices, speed reduction, rationalization of ship schedules, increasing the efficiency of ship hulls, power plants and propellers, improved navigation aids, and a search for alternate fuels,

including those that are not petroleum based. A broad industry/government plan is formulated, suggesting how best to cope with either moderate or severe fuel shortages in the short-term as well as in the long-term.

INDUSTRY AND AGRICULTURE

REFER ALSO TO CITATION(S) 44865

44954 (FEA/D—76/291) **Study of energy conservation potential in the meat packing industry.** (Federal Energy Administration, Washington, D.C. (USA). Office of Energy Conservation and Environment). Nov 1976. 282p. $GPO $3.40.

Industrial energy audits and follow-up conservation programs are virtually demanded by the realities of today's energy restrictions. The meat packing industry, with its overwhelming dependence on a declining energy source and as one of the largest energy consumers in the food industry, provides an excellent case in point. The industry now spends nearly $664 million for energy alone, and the need to evaluate and review energy use patterns on a continuous basis is becoming a major management responsibility. Recognizing the necessity to use energy more efficiently, meat packing managers volunteered to be the subjects of this study. Pilot audits of representative plants in the meat packing industry were conducted. One large, two medium size and two small plants were selected to obtain a cross-section of the industry. This compendium of case studies provides a summary of the plant's energy audit, recommendations on increasing energy efficiency through different time frames, a suggested reporting and monitoring system for tracking energy consumption, and illustrative appendices and attachments. A section of attachments generally applicable to each case study appears at the end.

44955 (FEA/D—77/243) **Maximum energy efficiency improvement target for SIC 28: Chemical and Allied Products Industry.** (Battelle Columbus Labs., Ohio (USA)). 4 Mar 1977. Contract EM-76-C-01-8625. 48p. Dep. NTIS, PC A03/MF A01.

On the basis of the best data available and judgments of technical feasibility and economic practicability, the maximum energy efficiency improvement target for the chemical and allied products industry, Standard Industrial Classification (SIC) 28, is as follows: estimated Gross Target, 17%; estimated offset (for environmental control systems, changes in product mix, and other special circumstances) -3%; estimated net target, 14%: Because no single plant or company represents a weighted average of all 28 subindustries, the above target applies only to the entire chemical and allied products industry, SIC 28. Further, no company or plant represents a weighted average of any individual subindustry; hence, the subindustry goals developed as an essential part of building the total industry picture cannot be applied to individual companies or plants. The basis for these estimates was developed by estimating energy usage and the maximum feasible conservation measures in each of the 28 subindustries within SIC 28. The physical volume of shipments from SIC 28 establishments is projected to increase by 36% between 1972 and January 1, 1980.

MATERIALS

44956 (CONF-770448—3) **Econocrete. Preprint 2845.** Halm, H.J. (American Society of Civil Engineers, New York). 1977. 31p. American Society of Civil Engineers, New York $1.00.

From American Society of Civil Engineers spring convention; Dallas, TX, USA (25 Apr 1977).

Econocrete is a portland cement concrete which uses local commercially-produced aggregates which do not necessarily meet conventional quality standards for aggregates in pavements. The aggregates in econocrete may be crushed local stone or recycled concrete. Econocrete has been used in 23 projects in 15 different states. These projects, the equipment and materials used, costs, and the paving results obtained are discussed. In 2 years econocrete has received national recognition. Engineers have quickly recognized the superiority of econocrete subbases. The need for utilizing local aggregates and conserving our higher quality good concrete aggregates in composite pavement designs has stimulated the interest and programs of other engineers throughout the country. Recycling has potential for economics, aggregate and energy conservation, and consequently has become an interesting new concept. (LCL)

EQUIPMENT AND PROCESSES

REFER ALSO TO CITATION(S) 44853, 44855

44957 (CONF-770448—2) **Use of the dryer drum. Preprint 2843.** Foster, C.R. (American Society of Civil Engineers, New York). 1977. 9p. American Society of Civil Engineers, New York $1.00.

From American Society of Civil Engineers spring convention; Dallas, TX, USA (25 Apr 1977).

It is shown that the production of hot asphalt paving mixtures in a dryer drum mixer operating at 220° to 230°F will save money and fuel as compared with asphalt production in a conventional plant requiring mixing temperatures of 275° to 325°F. It is estimated that use of the drum mixer will reduce the energy requirement for producing asphalt by 25% and increase peak production by as much as 30%. (LCL)

44958 (IS-M—145) **No-bake systems in modern foundry technology.** Chen, C.W. (Iowa State Univ. of Science and Technology, Ames (USA)). 1978. Contract W-7405-ENG-82. 22p. Dep. NTIS, PC A02/MF A01.

An innovation in modern foundry technology is the use of no-bake systems for the preparation of sand molds and cores. As the name suggests, a no-bake system consists of two or three chemicals, which cure the sand in molds and cores at room temperature without heating. The sand is cured by a chemical process through the reactions of a binder and a catalyst. The five classes of no-bake systems that have been developed to date are described, and their advantages and shortcomings are compared. The chemical molding method offers several advantages including: improved quality of castings; better dimension control; lower overall casting cost; higher productivity, and more efficient operation of the foundry works with lower skillful laborers, less supervision and greater flexibility. But the use of organic binders involves odor, fumes, toxicity and flammability which are health and safety hazards. The cost of adopting the no-bake system varies from small to large investments, depending upon the degree of automation and mechanization of the no-bake molding plant. The cost of the no-bake foundry can be greatly reduced, however, if sand reclamation becomes successful. Since 1970, many foundries in the U.S., England, France, West Germany, Russia and Japan have applied the no-bake systems. The benefits realized in a medium-size boiler and radiator manufacturer in the U.S. by switching from the oil-sand method to the cold-box process for making cores are cited. As a further example of the current trend to adopt the no-bake system in the U.S., the installation of a massive plant to use the phenol-BSA no-bake system for making 12,000 lb-stools for ingot molds in a U.S. Steel plant is described in details. Special reasons for small foundries to consider the no-bake systems are given.

44959 (PB—274136) **Energy-related impacts on Great Plains agricultural productivity in the next quarter century, 1976—2000. Great plains agricultural council publication.** (Great Plains Agricultural Council (USA)). 1976. 30p. (GPAC—82). NTIS PC A03/MF A01.

Contents: The food demand dimension; Agriculture's relationship to national energy goals; Assumptions relating to great plains agriculture; Agricultural energy usage in perspective; The emerging energy usage transition agenda; General energy related agricultural adjustment concepts; Operational and technological adjustments in energy intense components; Agribusiness impacts and adjustments; Forests and energy; Effects of great plains energy resource development on agriculture; Institutional and agency program demands.

WASTE HEAT RECOVERY AND UTILIZATION

REFER ALSO TO CITATION(S) 44869, 44870

44960 **Waste energy utilization in a rolling mill and in the subsequent treatment.** Klammer, H. *Stahl Eisen;* **97**: No. 22, 18(Nov 1977). (In German).

44961 **Energy utilization in steel production - present status and future possibilities.** Poettken, H.G.; Ussar, M.; Strohschein, H. *Stahl Eisen;* **97**: No. 22, 16(Nov 1977). (In German).

44962 **Utilization of thermal energy in the plastic industry.** Heitz, E. *Plastverarbeiter;* **27**: No. 2, 65-73(1976). (In German).

Methods basically feasible for the recovery of thermal energy from cooling systems in the plastics industry are introduced. These are: recuperative and regenerative systems and heat pumps. The examples illustrating application refer to a plant for glass-reinforced plastics, whereby costs are estimated on the basis of a plate heat exchanger.

INDUSTRIAL WASTE MANAGEMENT

44963 (PB—274556) **Economic adjustment strategy study for San Joaquin County, California.** (San Joaquin County, Stockton, Calif. (USA); Economics Research Associates, San Joaquin, Calif. (USA)). Nov 1977. 129p. NTIS PC A07/MF A01.

The economic adjustment strategy report on San Joaquin County in California has several objectives in mind to meet the funding guidelines. The objectives are to determine the feasibility of

the continued manufacture of recycle paperboard, folding cartons and other paperboard products; to identify pending or potential losses in industrial employment in San Joaquin County among other firms; and to define the appropriate strategy and action program for retaining and expanding the industrial activity among present San Joaquin County firms. This study has been divided into two phases, the first dealing specifically with the new firm and the feasibility of its operation. The second phase identifies other possible losses of industry and derives a strategy and program for corrective action.

44964 (PB—274881) **Information about hazardous waste management facilities.** Farb, D.; Ward, S.D. (Environmental Protection Agency, Washington, D.C. (USA). Office of Solid Waste Management Programs). Jul 1975. 149p. (EPA/530/SW—145). NTIS PC A07/MF A01.

This document contains information on 64 hazardous waste management facilities known to EPA as of August 1974. The information is presented in the form of a standard resume for each facility. The information was obtained through both telephone interviews with knowledgeable representatives of firms operating hazardous waste management facilities, and facility site visits. The register is not all inclusive and the comprehensiveness of the information on each facility varies depending on the method of information acquisition that was used. A continuing effort using the same information acquisition techniques is being made by the Technology Assessment Staff of the Hazardous Waste Management Division, not only to improve the comprehensiveness of the information in the facility resumes, but also to expand the register to include other hazardous waste management facilities. Reissuance is anticipated approximately on an annual basis.

44965 **Steel industry wastes.** Smith, D.W. *J. Water Pollut. Control Fed.;* **49**: No. 6, 1172-1180(Jun 1977).

Part of this review of the 1976 literature deals with coke production and considers problems of carbonization effluents.

MUNICIPALITIES AND COMMUNITY SYSTEMS

REFER ALSO TO CITATION(S) 44861

44966 (N—77-33683) **Review of current interest and research in water hyacinth-based wastewater treatment. Final report.** Markarian, R.K.; Balon, J.E.; Robinson, A.C. (Battelle Columbus Labs., Ohio (USA)). Feb 1977. Contract NASW-2800. 59p. (NASA-CR—155150; BCL-OA-TFR—77-1). NTIS PC A04/MF A01.

The status of activity in the user community for water hyacinth-based wastewater treatment was evaluated. The principal technique used was that of interviewing people who either (1) were known to be engaged in hyacinth research or development or (2) had made inquiry to NASA about hyacinth systems. About 40 non-research organizations and a similar number of research organizations were contacted. As a result of the interviews and a review of the relevant literature, it was concluded that hyacinth systems have the potential for providing a lower cost way for small cities to meet increasingly stringent effluent requirements. A limited amount of full-scale demonstration of hyacinth systems has been carried out during the past two years, but the yield of design data has been small. Several organizations are currently planning construction of experimental full-scale hyacinth-based wastewater treatment systems during 1977-1978.

CONSERVATION SERVICES

REFER ALSO TO CITATION(S) 44871

PUBLIC SERVICES

REFER ALSO TO CITATION(S) 44125

PUBLIC UTILITIES

REFER ALSO TO CITATION(S) 44869

44967 **Interviews concerning topical questions in the German electricity supply industry.** *Elektrizitaetswirtschaft;* **75**: No. 12, 289-312(Jun 1976). (In German).

The editors of "Elektrizitaetswirtschaft" have questioned eleven leaders in the German electricity supply industry on particularly urgent topics, namely: (a) prospects for the future of the German electricity supply industry, (b) financing problems of the electricity supply industry, (c) application of hard coal in power stations, (d) uranium supply, (e) prospects for the future of electric heat, (f) development of nuclear energy, (g) reprocessing of nuclear fuels, (h) distribution problems, (i) the role of electricity in the rational use of energy, (j) reasons for the construction of power stations developed under joint venture and their possible forms of business organization, (k) the IZE as an instrument of public relations of the electricity supply industry.

MUNICIPAL WASTE MANAGEMENT

44968 **Hygienization of sewage sludge by electron irradiation.** Tofaute, K. (Brown, Boveri and Co. Ltd., Baden (Switzerland)). *Proc. Fac. Sci. Tokai Univ.;* **24**: No. 1, 22-23(Jan 1978).

An electron irradiation, economically viable, process for the hygienization of sewage sludge has advantages over some other methods in use, and provides a sterile product suitable for use as a fertilizer. The process is described. Process characteristics, suitability as fertilizer, characteristics due to the system, operating and investment costs and operating experience are discussed.

ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

44969 (N—77-33519) **Compendium of critiques of JPL report SP-43-17: automotive technology status and projections project.** Williams, A.N. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 18 Jul 1977. Contract NAS7-100. 644p. (NASA-CR—155180; JPL-PUB—77-40). NTIS PC A99/MF A01.

Almost 50 critiques of the Jet Propulsion Laboratory report SP-43-17 are presented together with the JPL responses.

SPARK-IGNITION

REFER ALSO TO CITATION(S) 44973

ROTARY

REFER ALSO TO CITATION(S) 44980

ELECTRIC-POWERED SYSTEMS

44970 **New generation of locomotives with three-phase motors.** *Elektr. Energ. Tech.;* **22**: No. 5, 243-244(Oct 1977). (In German).

Three-phase asynchronous motors have proved to be particularly suitable for driving high-power locomotives. The article reviews various possibilities and gives a short description of the locomotives used, all with three-phase motors. The common element of all variants of this type of drive is the power transmission part, from the dc intermediate circuit and the converters to the three-phase asynchronous motors, while the type of power supply varies.

HYBRID SYSTEMS

44971 (ALO—41/2) **Study of heat engine/flywheel: hybrid propulsion configuration with electrical transmission system, Phase II, final report. Design definition.** (AiResearch Mfg. Co., Los Angeles, Calif. (USA)). Apr 1978. Contract EY-76-C-04-0739. 28p. Dep. NTIS, PC A03/MF A01.

A study was made to conceive and evaluate a flywheel/electrical transmission system. The investigation encompassed several machinery and electronic options, and each transmission option was evaluated and ranked according to cost, weight, and fuel economy. The vehicle used for the evaluation was a five-passenger family sedan. The primary use of this transmission system is to augment the heat engine with energy from the flywheel in such a manner as to level engine loads and improve the overall vehicle efficiency. It was determined that the ac—ac transmission system is the most attractive for vehicular applications in the weight range investigated. A comparison was made between a conventionally propelled (heat engine/automatic transmission) vehicle and the same vehicle configured with the hybrid propulsion arrangement that utilized the selected ac—ac transmission system. The results of this comparison are shown. The conventional vehicle has a curb weight of 3000 lb, whereas the same vehicle configured with the hybrid arrangement has a curb weight of 2866 lb. Both vehicles have the same acceleration and pass maneuver performance. The capability for steady-state hill climb of a 5% grade, which established the heat engine size, is limited to 55 mph for the hybrid vehicle. This is in compliance with study requirements. The hybrid's fuel consumption is 39.5 mpg, compared to 15 mpg projected for the conventional vehicle. This represents a 263% improvement and also exceeds any postulated Federal economy standards. The hybrid also provides a 40% savings in direct operating cost to the consumer. These benefits are derived for a $2330 increase in vehicle retail (sticker) price.

FLYWHEEL PROPULSION

REFER ALSO TO CITATION(S) 44971

44972 Flywheel energy storage systems for road vehicles. Tests with glass-fibre compound constructions. *VDI (Ver. Dtsch. Ing.) Nachr.;* **31**: No. 36, 18-19(Sep 1977). (In German).

The article deals with possible applications of flywheel energy storage systems in vehicles. Apart from a survey of the power density to be achieved with different materials (steel, glass-fibre compound materials) and the different types of construction, a survey is also given of possible applications of flywheels in connection with international-combustion engines for vehicle propulsion.

VEHICLE DESIGN FACTORS

REFER ALSO TO CITATION(S) 44873

ENGINE-TRANSMISSION MATCHING

REFER ALSO TO CITATION(S) 44971

ENGINE SYSTEM

44973 (SAND—77-8299) **Variable-displacement spark-ignition engine. Final report.** Pouliot, H.N.; Robinson, C.W.; Delameter, W.R. (Sandia Labs., Livermore, Calif. (USA)). May 1978. Contract EY-76-C-04-0789. 102p. Dep. NTIS, PC A06/MF A01.

A five-cylinder variable displacement research engine was designed, built, and tested. Displacement is varied by changing the piston stroke using a four-bar linkage. Before the engine was built, its dynamics were thoroughly analyzed, and a five-cylinder configuration was selected to minimize vibration. Test data show that BSFC is, as expected, less dependent on load than in conventional engines, and averages less than 0.5 lb/bhp-hr over the load and speed range of ordinary automobile operation. The impact of exhaust gas recirculation on emissions levels was studied experimentally. Several methods for estimating urban fuel economy from dynamometer data predict a 20 to 25% improvement compared with conventional engines at the same emissions levels.

44974 Additional air control device for an internal combustion engine. Hattori, T.; Yamaguchi, H.; Nakase, T. (to Nippon Soken, Inc.). US Patent 4,084,563. 18 Apr 1978. Priority date 11 Nov 1975, Japan. 12p.

An additional air control device for an internal combustion engine is described wherein an additional air supply to the engine is controlled by controlling the operation of a drive motor coupled to a control valve mounted in a bypass passage. The driving direction of the drive motor to open or close the control valve is controlled by a gas sensing signal representing the content of the exhaust gas and generated by a gas sensor, and the duty ratio between the drive time period tau a and the rest time period tau b of the drive motor is controlled depending on an intake air flow signal representing a delay time factor from an intake air flow meter. In deceleration operation of the engine, the duty ratio tau a/tau b is increased independently of the intake air flow signal by a deceleration signal produced by a deceleration detecting switch. The drive motor is thus controlled to drive in a skip movement fashion and to stop alternately with the duty ratio of tau a/tau b in an opening or closing direction of the control valve, thereby the air-fuel ratio is maintained at a constant value and the exhaust gas emission is controlled.

44975 Fuel metering device. Eckert, K. (to Robert Bosch GmbH). US Patent 4,084,562. 18 Apr 1978. Priority date 8 Aug 1972, German, Federal Republic of (F.R. Germany). 4p.

A fuel metering device for low fuel feed pressures is described which is adapted for use in an externally ignited internal combustion engine of the air/fuel mixture-compressing type having an air-intake suction tube, and which comprises (a) conduit means for conveying fuel to the suction tube of the engine, (b) throttle means of determinable cross-sectional throttle area disposed in the conduit means, (c) bypass duct means for bypassing the throttle means, and (d) control means for switching the bypass means into the fuel flow through the conduit means to bypass the aforesaid throttle means, thereby varying the ratio of the amounts of fuel and air in the mixture being formed in the suction pipe; the control means are responsive to characteristic engine data.

44976 Engine air-to-fuel ratio control system. Hattori, T.; Iwata, T.; Nakase, T. (to Nippon Soken, Inc.). US Patent 4,084,560. 18 Apr 1978. Priority date 24 Aug 1974, Japan. 8p.

A system for controlling an air-to-fuel ratio of a gas mixture supplied to a vehicle engine to a correct valve is disclosed. In response to an output signal from a discriminator circuit which receives as inputs a signal from an air-to-fuel ratio detector mounted in an exhaust pipe and simultaneously in response to a signal from an aperture detector which detects the aperture of a control valve mounted in an adjusting air path provided parallel to a carburetor, a pulse motor for adjusting the aperture of the control valve provided in the air path is driven to obtain a correct air-to-fuel ratio.

44977 Speed control apparatus for an internal combustion engine. Wallbaum, H. (to Volkswagenwerk Aktiengesellschaft). US Patent 4,084,559. 18 Apr 1978. Priority date 15 Oct 1975, German, Federal Republic of (F.R. Germany). 6p.

A speed control apparatus for an internal combustion engine comprises a throttle valve in an intake pipe of the engine, a throttle adjusting element for actuating the throttle valve, and a speed control regulator connected to the throttle adjusting element. The regulator produces a signal representative of the difference between the actual value and a desired value of engine speed and the throttle adjusting element actuates the throttle valve in dependence upon this signal when the engine is not idling. Means are provided for moving the throttle valve into its idling position when the voltage supplied to the speed control regulator is interrupted. In accordance with the invention (1) the throttle adjusting element is permanently mechanically coupled to the throttle valve; (2) switch means are provided which automatically interrupt the voltage supplied to the speed control regulator when the engine speed falls below a minimum value that lies below idling speed; and (3) a starting pulse switch is connected in parallel with the above-mentioned switch for supplying a voltage pulse to the speed control regulator determinative of the starting position of the throttle valve.

44978 Air-to-fuel ratio controlling system for internal combustion engines. Hattori, T.; Nakase, T. (to Nippon Soken, Inc.). US Patent 4,084,558. 18 Apr 1978. Priority date 27 Feb 1975, Japan. 8p.

An air-to-fuel ratio controlling system for an internal combustion engine is provided with a deceleration detector for detecting the deceleration operation of the engine. In response to a signal delivered from the deceleration detector, a control valve mounted in the adjusting air path is maintained at a given valve angle for a predetermined period of the deceleration. Air is, thus, additionally supplied through the adjusting air path during the deceleration, thereby to prevent unduly rich of the air-fuel mixture during the deceleration and to enable the control of the air-to-fuel ratio properly.

44979 Internal combustion engine with air-fuel mixture compression. Eisele, E. (to Daimler-Benz A.G., Stuttgart (Germany, F.R.)). German(FRG) Patent 2,548,133/A/. 5 May 1977. 7p. (In German).

The invention pertains to an internal combustion engine with air-fuel mixture compression, where the main combustion chamber is arranged inside the piston or the cylinder head. An ignition chamber with injection valve and spark plug is arranged out of line with it. The ignition chamber is connected with the main combustion chamber via an ignition duct. The connection is arranged in such a way that the ignition jet generated is led over the shortest possible distance and is deflected towards the gravity center of the main combustion volume.

EMISSION CONTROL

REFER ALSO TO CITATION(S) 44974, 44975, 44978

NITROGEN OXIDES

REFER ALSO TO CITATION(S) 44995

44980 Rotary piston engine exhaust gas recycling means. Satow, H. (to Toyo Kogyo Co. Ltd.). US Patent 4,084,549. 18 Apr 1978. Priority date 3 Apr 1975, Japan. 10p.

A method of exhaust gas recycling is described in which exhaust gas is recycled and introduced via a port which is formed in the peripheral wall of a rotary piston engine. The port may also serve for introduction of air or an air-fuel mixture required for low-speed operation of the engine. The gas then flows into a leading zone of an intake chamber. Since the port formed in the peripheral wall is so disposed that the air or air-fuel mixture introduced tend to be stratified at the leading zone of the intake chamber, the recycle exhaust gas also tends to be stratified at the same leading zone so that the recycled exhaust gas tends to exist in vicinity of the spark plug, whereby less exhaust gas is required to be recycled since a given amount of exhaust gas is more effective in preventing production of nitrogen oxides, and there is correspondingly less engine wear and attendant production of hydrocarbons or similar compounds.

44981 Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975). 207p. (CONF-740349—P7). $19.95.

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

Fourteen papers are presented on catalysts for removing pollutants from automobile exhaust gases, specifically CO, HC, and NO/sub x/. A separate abstract was prepared for each paper for inclusion in US DOE Energy Research Abstracts (ERA). (PMA)

44982 Catalytic reduction of oxides of nitrogen emissions into auto exhaust gas. Mannion, W.A.; Aykan, K.; Cohn, J.G.; Thompson, C.E.; Mooney, J.J. (Engelhard Minerals and Chemicals Corp., Menlo Park, Edison, NJ). pp 1-13 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

A discussion is given of the progress made in developing catalysts for use in the control of nitrogen oxides from automotive exhaust. A stabilized supported ruthenium catalyst for use as the NO/sub x/ reduction bed in a dual-bed system was evaluated in laboratory bench tests and on an engine dynamometer with lead sterile and unleaded fuel. Catalyst exposure to high-temperature lean operation on an engine dynamometer revealed that the catalyst is not completely stable to such an environment. Initial evaluation of a three-way conversion (TWC) catalyst demonstrated that good conversion of carbon monoxide, hydrocarbons, and nitrogen oxides is maintained after exposure to elevated temperatures under oxidizing conditions using unleaded fuel.

44983 Thermocatalytic detection of NO/sub x/. Innes, W.B. (Purad Inc., Upland, CA). pp 14-23 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

Thermocatalytic detection by catalyst bed temperature rise was applied to NO/sub x/ using V_2O_5-Al_2O_3 catalyst. This involved the highly exothermic reaction of NH_3 with NO and O_2 to produce H_2O and N_2 or N_2O. Detector response was proportional to NO level when $NH_3/NO > 2$. Flow rates of 1 to 2 ft^3/hr with .03 cm^3 catalyst at 300 to 400°C seemed to be optimum. Higher oxides of nitrogen than NO, and their hydrates, responded like NO, whereas N_2O and SO_2 gave negligible responses. The method has application in measuring NO/sub x/ directly in most sources. HC, CO, and NO/sub x/ in vehicle exhaust can be analyzed by series flow through V_2O_5-Al_2O_3 catalyst (HC), V_2O_5-Al_2O_3 bed (further HC removal), and Pt catalyst (CO detection), followed by NH_3 introduction and V_2O_5-Al_2O_3 catalyst (NO/sub x/ detection).

44984 Thermodynamic interaction between transition metals and simulated auto exhaust. Simpson, H.D. (Union Oil Co. of California, Brea). pp 39-53 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

A computer study of the equilibrium concentrations of the major constituents in auto exhaust, and of the equilibrium relations of various transition metals with these constituents, provides some interesting insights into the state of chemical combination expected for metals used as NO/sub x/ catalysts. The state of chemical combination of most metals is not affected appreciably by changes in the air/fuel ratio in the normal range. The sulfates of many metals can form in auto exhaust under nearly all normal conditions. Sulfides and oxides can form in much of the normal range. Thus, sulfating, sulfiding, and oxidation can all contribute significantly to catalyst deactivation.

44985 Platinum catalysts for exhaust emission control: the mechanism of catalyst poisoning by lead and phosphorus compounds. Acres, G.J.K.; Cooper, B.J.; Shutt, E.; Malerbi, B.W. (Johnson Matthey and Co. Ltd., Wembley, Eng.). pp 54-71 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

The effect of lead and phosphorus on platinum catalysts used to meet United States car exhaust emission legislation is assessed. While phosphorus was the most toxic element on a w/w basis, interaction between phosphorus and lead compounds resulted in the trace lead in the fuel contributing the major effect. Evaluation of lead poisoning using tetraethyllead indicates a first order deactivation process with adsorption of lead being controlled predominantly by degradation of tetraethyllead prior to arrival at the catalyst surface. It is suggested that adsorbed lead may consist of particulate and nonparticulate species; the former has relatively little effect on catalyst performance whereas the latter adsorbs on active sites resulting in significant degradation even at levels less than 0.05 g lead/US gal.

44986 Deposition and distribution of lead, phosphorus, calcium, zinc, and sulfur poisons on automobile exhaust NO/sub x/ catalysts. McArthur, D.P. (Union Oil of California, Brea). pp 85-102 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

Catalyst degradation by poisons originating in engine oil and fuel is discussed. Electron probe line scans and x-ray images characterize the variation in contaminant concentrations in both particulate and monolithic NO/sub x/ catalysts. Surface contamination was characterized by ESCA. Axial and radial distributions of contaminants were determined for monolithic NO/sub x/ catalysts subjected to extensive engine testing. The major contaminants were calcium, lead, phosphorus, and zinc. The concentrations of all contaminants, except possibly lead, varied insignificantly in the radial direction. For all contaminants, the concentration varied greatly in the axial direction, being greatest at the upstream end of the monolith. The degree of contaminant retention on monolithic NO/sub x/ catalysts was P > Pb > Zn > Ca >> S.

44987 Thermally stable carriers. Gauguin, R.; Graulier, M.; Papee, D. (Rhone-Poulenc, Paris). pp 147-160 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

The textural and mechanical properties of carriers for auto emission catalysts should remain stable after exposure to high temperatures. Most high surface aluminas undergo nonhomogeneous crystallite growth and loss of porosity and mechanical strength when heated to 1000°C. Conversely, a single-phased pure alumina prepared from finely crystallized α-monohydrate which first transforms into γ-alumina, has the required stability; it still consists of a homogeneous delta-alumina phase at 1000°C. Ordinary aluminas cannot be sufficiently stabilized by incorporation of foreign oxides. However, some rare earth oxides, when added to γ-alumina, extend its stability to 1250°C by forming a theta-alumina phase, the specific surface of which still exceeds 25 m^2/g. Such compounds offer new possibilities for catalysts submitted to extreme temperatures.

CARBON MONOXIDE

REFER ALSO TO CITATION(S) 44976, 44980, 44981, 44982, 44985, 44987

44988 Waste gas control in cars as an active contribution to environmental protection. Hess, W.; Glogg, P. *Staub-Reinhalt. Luft;* 37: No. 11, 417-422(Nov 1977). (In German).

As well for Zurich the air pollution due to waste gases from cars is of great actuality. For 1975 the exhausted pollutants were estimated at 30.000 tons. This year again a measurement campaign was organized for values of CO-emission of the circulating cars by means of a MAIHAK compact-UNOR analyser. The results obtained were decoded for age and type of the cars. The number of cars complained of having a CO-concentration in waste gas of more than 4.5 percent of volume of the idle running diminished from 32.4% in 1974 to 21.5% in 1976.

44989 Relative resistance of noble metal catalysts to thermal deactivation. Lester, G.R.; Brennan, J.F.; Hoekstra, J. (Universal Oil Products Co., Des Plaines, IL). pp 24-31 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

Fresh and thermally aged catalysts containing mixtures of platinum and palladium were laboratory tested for the oxidation of carbon monoxide, propane, and propylene. For both monolithic and particulate catalysts, resistance to thermal deactivation was optimum when palladium content was 80%. Full-scale vehicle tests confirmed these findings. Catalysts of this composition were developed which, on the basis of durability tests appeared capable of meeting the 1977 Federal Emissions Standards with as little as 0.56 g noble metal per vehicle. The catalyst support was thermally-stabilized, low density particulate.

44990 Variation of selectivity with support chemistry in NO/sub x/ removal catalysts. Dolbear, G.E.; Kim, G. (W. R. Grace and Co., Columbia, MD). pp 32-38 of Catalysts for the control of automotive

pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

Ammonia selectivity of platinum and platinum-nickel catalysts for NO/sub x/ reduction varies with the nature of the supporting oxide. Silica, alumina, and silica-alumina supports on monolithic substrates were studied using synthetic automotive exhaust mixtures at 427° to 593°C. The findings are explained by a mechanism whereby the reaction of nitric oxide with adsorbed ammonia is in competition with ammonia desorption. The ease of this desorption is affected by the chemistry of the support. Ammonia decomposition is not an important reaction on these catalysts when water vapor is present.

44991 Comparison of platinum and base metal oxidation catalysts. Barnes, G.J. (General Motors Corp., Warren, MI). pp 72-84 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

The activities of fresh, supported platinum and base metal oxidation catalysts are evaluated in vehicle tests. Two catalysts of each type were tested by the 1975 FTP in four 600 to 4300 cm^3 catalytic converters installed on a vehicle equipped with exhaust manifold air injection. As converter size decreased, base metal conversions of HC and CO decreased monotonically. In contrast, the platinum catalysts maintained very high 1975 FTP CO conversions (> 90%) at all converter sizes; HC conversions remained constant (approximately 70%) at volumes down to 1300 cm^3. Performance of the base metal catalysts with the 4300-cm^3 converter nearly equalled that of the platinum catalysts. However platinum catalysts have a reserve activity with very high conversions attained at the smallest converter volumes, which makes them more tolerant of thermal and contaminant degradation.

44992 Chemistry of degradation in automotive emission control catalysts. Klimisch, R.L.; Summers, J.C.; Schlatter, J.C. (General Motors Research Labs., Warren, MI). pp 103-115 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

The parameters that affect the degradation of supported platinum and palladium automotive exhaust catalysts are investigated. The study includes the effects of temperature, poison concentration, and bed volume on the lifetime of the catalyst. Thermal damage primarily affects noble metal surface area. Measurements of specific metal area and catalytic activity reveal that supported palladium is more thermally stable than platinum. On the other hand, platinum is more resistant to poisoning than palladium. Electron microprobe examinations of poisoned catalyst pellets reveal that the contaminants accumulate almost exclusively near the skin of the pellet as lead sulfate and lead phosphate. It is possible to regenerate these poisoned catalysts by redistributing the contaminants throughout the pellet.

44993 Optimum distribution of catalytic material on support layers in automotive catalysis. Wei, J.; Becker, E.R. (Univ. of Delaware, Newark). pp 116-132 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

Classical analysis has demonstrated that a given quantity of active material should be deposited over the thinnest layer possible in order to minimize diffusion limitations in the porous support. This conclusion may be invalid for automotive catalysis. Carbon monoxide oxidation over platinum exhibits negative order kinetics so that a drop in CO concentration toward the interior of a porous layer can increase the reaction rate and increase the effectiveness factor to above one. The relative advantage of a thin catalytic layer is further reduced when one considers its greater vulnerability to attrition and to the deposition of poisons. This analysis is demonstrated, and it is concluded that a thick layer may have advantages over a thin layer.

44994 Oxidative automotive emission control catalysts: selected factors affecting catalyst activity. Doelp, L.C.; Koester, D.W.; Mitchell, M.M. Jr. (Air Products and Chemicals, Inc., Linwood, PA). pp 133-146 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

Certain factors are analyzed to determine their effects on automotive catalyst activity. At operating gas velocities, spherical catalysts were more active than monolithic catalysts at comparable catalyst volumes and metals loadings. Palladium was the most active catalyst metal. Platinum in a mixed platinum-palladium catalyst stabilizes against the effects of lead poisoning. An optimum activity particulate catalyst would contain about 0.05 wt % total metals on a gamma-alumina base with a platinum content of 0.03 to 0.04 wt % and a palladium content of 0.01 to 0.02 wt %. A somewhat thick shell of metals located near the outer surface of the particle provides better catalyst activity than a shell type distribution of metals.

44995 Spinel solid solution catalysts for automotive applications. Leech, C.A. III; Campbell, L.E. (Corning Glass Works, NY). pp 161-177 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

Enhancement of initial oxidation activity and thermal stability of catalytically active, transition metal oxide spinels is achieved by forming solid solutions with spinels with low catalytic activity and excellent surface area stability. Unsupported solid solutions of $CuCo_2O_4$, $CuMn_2O_4$, $CuFe_2O_4$, Co_3O_4, $ZnCo_2O_4$, or $CoFe_2O_4$ as the catalytically active spinel with $NiAl_2O_4$ or $ZnAl_2O_4$ as the high surface area spinel are characterized for physical properties, chemical structure, and catalytic activity. Oxidation, reduction, and water-gas shift reaction data were obtained for monolithically supported $CuMn_2O_4$ or $CuFe_2O_4$ in solid solution with $NiAl_2O_4$ or $ZnAl_2O_4$. $NiAl_2O_4$ appears to be exceptionally suitable as an isostructural host for catalytically active spinels. For various reasons, these solid solutions are doubtful candidates for use as automotive catalysts for oxidation or reduction.

44996 Oxidation of CO and C_2H_4 by base metal catalysts prepared on honeycomb supports. Kummer, J.T. (Ford Motor Co., Dearborn, MI). pp 178-192 of Catalysts for the control of automotive pollutants. McEvoy, J.E. Washington, DC; American Chemical Society (1975).

From 167. national meeting of the American Chemical Society; Los Angeles, CA, USA (31 Mar 1974).

See CONF-740349—P7.

A description is given of some laboratory experiments that were performed in order to assess the activity of base metal catalysts prepared using honeycombs as the substrate for the base metal catalyst alone or as the substrate for the washcoat together with the base metal catalyst. This investigation is continuing so the information given constitutes only a progress report.

HYDROCARBONS

REFER ALSO TO CITATION(S) 44976, 44980, 44981, 44982, 44985, 44989, 44990, 44991, 44992, 44994, 44995, 44996

44997 Simple method for rapid detection of hydrocarbon groups in petrol and exhaust gases. Maier, K.; Schriewer, M. *Chem.-Ing.-Tech.;* **49**: No. 11, 905(Nov 1977). (In German).

MATERIALS

44998 Thermodynamics of the lanthanide trifluorides. I. The heat capacity of lanthanum trifluoride, LaF_3 from 5 to 350°K and enthalpies from 298 to 1477°K. Lyon, W.G.; Osborne, D.W.; Flotow, H.E. ; Grandjean, F.; Hubbard, W.N.; Johnson, G.K. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *J. Chem. Phys.;* **69**: No. 1, 167-173(1 Jul 1978).

The heat capacity of a sample of LaF_3 was determined in the temperature range 5—350°K by aneroid adiabatic calorimetry and the enthalpy from 298.15 to 1477°K by drop calorimetry. The heat capacity at constant pressure C°/sub p/(298.15°K), the entropy S° (298.15°K), the enthalpy [H° (298.15°K)-H° (0)] and the Planck function -[G° (298.15°K)-H° (0)]/298.15°K; were found to be (90.29 +- 0.09) J °K⁻ 1xmole⁻ 1, (106.98 +- 0.11) J °K⁻ 1xmole⁻ 1, (16717 +- 17) J mole⁻ 1, and (50.91 +- 0.05) J °K⁻ 1xmole⁻ 1. The thermal functions from the present research were extended up to the melting temperature (1766°K) by combination with previously published results. The anomalously high heat capacity from about 1100 to 1766°K is discussed.

44999 Correspondence of conduction band minima and electron mobility maxima in dielectric liquids. Holroyd, R.A.; Cipollini, N.E.

(Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973). *J. Chem. Phys.;* **69**: No. 1, 501-503(1 Jul 1978).

Conduction band energies are reported for neopentane and tetramethylsilane up to the critical point.(AIP)

45000 Optical study of the temperature dependent scattering of the a exciton (polariton) of naphthalene. Robinette, S.L.; Small, G.J.; Stevenson, S. (Ames Laboratory-USDOE and Department of Chemistry, Iowa State University, Ames, Iowa 50011). *J. Chem. Phys.;* **68**: No. 11, 4790-4803(1 Jun 1978).

High resolution (~0.1 cm^{-1}) one-photon absorption profiles of the a band of naphthalene at 31 475 cm^{-1} from pure strain-free mounted (PSF) crystals have been measured between ~2 and 40 K. Low temperature linewidths (FWHM) as narrow as 0.4 cm^{-1} have been observed. The a band profile exhibits an asymmetry which increases with the temperature. The high E side is close to Lorenztian at all temperatures (particularly for T> or ≈8 K) and tails more steeply than the low E side. Arguments are presented for the asymmetric line shape being homogeneous so that the T-dependent FWHM are a direct measure of the transverse optical dephasing (T_2) of the a exciton. The data and theory are consistent with the exciton—phonon scattering contribution to T_2 being due to low frequency (ω/sub eff/~15 cm^{-1}) acoustical phonons. However, existing theories on asymmetric but homogenous exciton line shapes fail to account for the observed asymmetries.

METALS AND ALLOYS

PREPARATION AND FABRICATION

REFER ALSO TO CITATION(S) 45035, 45134

45001 (AD-A—048485) **Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975—31 March 1977.** Witt, R.; Magnuson, J. (Grumman Aerospace Corp., Bethpage, N.Y. (USA)). Jun 1977. Contract N00019-76-C-0143. 111p. NTIS PC A06/MF A01.

This program established that fuselage braces (Part No. A51B21683) manufactured by the hot isostatic pressing (HIP) process can satisfy flight requirements for forged parts. The HIP braces withstood 24,000 equivalent flight hours (four design lives) without failure. The projected cost saving related to the utilization of the HIP process in manufacturing of these parts is in the range of 30 to 40%. Ti-6Al-6V-2Sn titanium alloys consolidated by HIP exhibited excellent fracture toughness and elongation characteristics, and obtained K/sub ic/ and percent elongation values in the range of 69-74 ksi sq root of in and 15-16%, respectively. Representative F/sub tu/ and F/sub ty/ values were approximately 3% below the current design specifications for forgings. However, these values can be increased by minor modifications in the oxygen content within allowable limits. Mechanical properties exhibited isotropic characteristics. Reproducibility studies indicated that current tight tolerances for machined components may have to be relaxed to assure that all dimensions of hot isostatically pressed (HIP'd) parts meet design specifications. Experimental welds on HIP and vacuum annealed materials met radiographic and ultrasonic acceptance criteria. Utilization of the HIP process in manufacturing fatigue-critical airframe components will depend on availability of high-quality powders with certified purity standards to insure freedom from inclusions.

45002 (AD-A—048588) **Investigation of separation-lubrication substances for use in isothermal forging. Final report, 16 December 1974—1 July 1976.** Spiegelberg, W.D. (Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Advanced Energy Systems Div.). Apr 1977. Contract F33615-74-C-5059. 76p. NTIS PC A05/MF A01.

A successful interface separation-lubrication substance for titanium alloy isothermal forging must simultaneously satisfy a number of demanding requirements including elevated-temperature stability in a preheating environment complete chemical compatibility with workpiece alloys and dies freedom from die accumulation tendencies minimal adhesion to the hot dies after forging and excellent friction reducing properties. Evaluation techniques for these factors (except for friction reduction) were developed and applied to a series of separation-lubrication compositions representing both current state-of-technology materials and advanced formulations. Other factors such as ease of application and fusion behavior were determined. Several classes of advanced compositions were evaluated at specific temperature intervals from 1300F to 1800F. These systems included both workpiece precoat and die applied coatings. Die materials represented IN-100, TRW VIA Mod R and silicon nitride; preheat time ranged from one-half to four hours; and titanium alloys included both the alpha-beta Ti-6Al-4V and the beta-stabilized 'Beta C'.

45003 (TID—28260) **Production of aluminum-silicon alloy and ferrosilicon and commercial purity aluminum by the direct reduction process. First quarterly progress report, 1 September 1977—30 November 1977.** Jarrett, N. (Aluminum Co. of America, Alcoa Center, Pa. Alcoa Labs.). Dec 1977. Contract EC-77-C-01-5089. 33p. Dep. NTIS, PC A03/MF A01.

Through computer modeling it was predicted that a carbothermic reduction process using carbon and oxygen to supply heat at temperatures up to approximately 2100°C and an alumina-silica-carbon feed will theoretically result in a complete conversion of the feed to Al—Si alloy and carbon monoxide in a refluxing reactor. Externally heated bench scale reactors were operated to determine the effect of ratio of charge on product yield and to establish the reaction mechanism. The tests indicated that a silica to alumina weight ratio of 0.5 to 1.1 was required to obtain high product yield. The reaction mechanism involves three major stages with a temperature gradient of approximately 1500° to 2100°C. Kinetics studies showed a linear correlation of reaction rate with heat input rate for the final reaction stage. Quantitative analytical procedures were developed for carbothermic products and intermediate phases. Operation of a bench scale fractional crystallization unit demonstrated the capability of reducing Si from 30 to 15% in the Al—Si alloy. Results were varified in a pilot crystallizer. Controlled cooling, draining and differential remelt procedures produced desirable reduction of impurities at acceptable product yield and recovery. Bench scale tests on purification to commercial grade Al resulted in a product purity of 99.9% when processing Al—Si—Fe and Al—Si—Ti alloys. The units operated at 92 to 98% efficiency.

45004 (TID—28288) **Development and evaluation of high chromium weld deposited overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Technical status report, January 1—January 31, 1978.** (International Nickel Co., Inc., Suffern, N.Y. (USA)). 1978. Contract EF-77-C-01-2621. 12p. Dep. NTIS, PC A02/MF A01.

Progress is reported on weld deposition techniques, inspection, and testing of single and double overlays of Inconel filler metal 72 on types 304 and 310 stainless steels. Tables of welding parameters, Vickers hardness of welded specimens, tensile test results, side bend test results, and microprobe analysis results, are presented. (GHT)

45005 Rate and pressure dependence of contaminants in vacuum-deposited aluminum films. Springer, R.W.; Catlett, D.S. (CMB-6, Los Alamos Scientific Laboratory, P.O. Box 1663, Los Alamos, New Mexico 87545). *J. Vac. Sci. Technol.;* **15**: No. 2, 210-214(Mar 1978).

Experiments have been conducted to measure the quantity of trapped impurities in electron-beam-deposited aluminum films. The depositions were conducted at the 1.3 x 10^{-4}—1.3 x 10^{-2} Pa pressure range with rates varying from a few tenths to 7.0 nm/s. An RGA was used to record the residual gas spectrum before and during all runs. The films were analyzed by sputter profiling and Auger electron spectroscopy. The chief contaminants found were carbon and oxygen. The carbon contaminant tracked the gauge pressure over two orders of magnitude ranging from a few atomic percent to the 500—1000 ppm range. The partial pressures of H_2O, O_2, and other gases were varied during deposition to determine their individual roles in contaminating the films. As a result, a relationship between the residual gas spectrum, and chemical analysis was found.

45006 Multisource deposition rate control using a mass spectrometer as a sensing element. Lutz, H. (Brookhaven National Laboratory, Upton, New York 11973). *J. Vac. Sci. Technol.;* **15**: No. 2, 309-312(Mar 1978).

A deposition rate controller for a multisource, high-rate, electron-beam evaporation system for simultaneous deposition of two to four materials is described. The system utilizes a quadrupole mass spectrometer as a material selective sensor to monitor the fluxes of the different evaporants, and a dedicated minicomputer serves as a process controller to adjust the deposition sources to maintain the desired rates. The computer can control a variable leak valve instead of one of the evaporation sources to maintain the desired partial pressure of a background gas. Experience gained in using the system is discussed.

STRUCTURE AND PHASE STUDIES

REFER ALSO TO CITATION(S) 44772, 45049

45007 (AD-A—048772) **Some observations on the structure of Ti—11.5Mo—6Zr—4.5Sn (beta III) as affected by processing history. Technical report.** Williams, J.C.; Froes, F.H.; Yolton, C.F. (Carnegie-Mellon Univ., Pittsburgh, Pa. (USA). Dept. of Metallurgy and Materials Science). Mar 1977. Contract N00014-76-C-0409. 16p. (JWTR—2).

This paper describes the effect of processing history on properties of the metastable beta titanium alloy Ti—11.5Mo—6Zr—

4.5Sn. It is shown that numerous earlier published accounts of properties have corresponded to non-optimum processing. In addition, attempts to correlate microstructure with properties have often been based on questionable microstructural interpretation; this paper also attempts to correct several of these points. Finally, the paper describes what is considered to be closer to if not optimum processing of this alloy.

45008 (AD-A—048773) **The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti—11.5Mo—6Zr—4.5Sn (beta III). Technical report.** Froes, F.H.; Yolton, C.F.; Wells, M.G.H.; Williams, J.C.; Capenos, J.M. (Carnegie-Mellon Univ., Pittsburgh, Pa. (USA). Dept. of Metallurgy and Materials Science). Aug 1977. Contract N00014-76-C-0409. 31p. (JWTR—3).

The effect of solution treatment temperature and oxygen content on the microstructure and age hardening response of the metastable beta alloy Ti—11.5Mo—6Zr—4.5Sn have been studied. Kinetics of formation of the equilibrium alpha-phase and the metastable omega-phase have been followed using Vicker's hardness measurements. These kinetics have been examined as a function of solution treatment temperature (above or below the beta-transus) and initial oxygen of the material. It has been found that the kinetics of formation of omega-phase is relatively insensitive to these variables, whereas alpha-phase is quite sensitive. The effect of these variables on microstructure has been evaluated using light microscopy, replica electron microscopy and thin-foil transmission electron microscopy. Several duplex aging treatments starting in the omega-phase temperature range and finishing in the alpha-phase temperature range were also examined. TEM of these samples has provided some insight into the mechanism of the omega → alpha in-situ transformation.

45009 (AECL—5626) **Measurement of crystallographic texture at Chalk River Nuclear Laboratories.** Winegar, J.E. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). May 1977. 29p. Dep. NTIS (US Sales Only), PC A03/MF A01.

X-ray diffraction is used at CRNL to measure crystallographic texture. This report defines and illustrates crystallographic texture, describes the operation of the measuring equipment, and assesses the direct and inverse pole measurement techniques. Specific reference is made to the measurement of texture in zirconium alloy tubes. The direct pole technique is preferred because it systematically measures more grain orientations, but the inverse pole technique is useful for rough approximations of texture or where specialized equipment is unavailable.

45010 (LBL—6998) **High resolution and high voltage electron microscopy at the University of California, Berkeley.** Thomas, G.; Westmacott, K.H. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jan 1978. Contract W-7405-ENG-48. 40p. (CONF-771165—1). Dep. NTIS, PC A03/MF A01.

From Conference on metals science(the emerging frontiers; Varanasi, India (23 Nov 1977).

Recent applications of high-resolution and high-voltage techniques at Berkely are described, using 100-kV TEMs and a standard 650-keV HVEM: grain boundary precipitation in Al—Zn, lattice imaging of grain boundaries in ceramics, steels, phase transitions and magnetic properties of ferrites, lattice defects, precipitation in Al—Si and behavior of interstitial dislocations under electron irradiation, effect of oxide films on loop formation in Al—Mg, and polytypism in magnesium Sialon. 13 refs. 12 figs. (DLC)

45011 **LEED analysis of a Cu(110) surface.** Noonan, J.R.; Davis, H.L.; Jenkins, L.H. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Vac. Sci. Technol.;* **15**: No. 2, 619-621(Mar 1978).

Experimental and calculated I—V profiles for the (0l-bar) diffraction beam from a Cu(110) surface are presented and compared. Preliminary results of this comparison suggest that the outermost atomic layer is contracted by ~10% relative to the bulk interlayer spacing, and there is some evidence that the second-third layer spacing may be slightly contracted. In order to demonstrate the reproducibility of the data obtained in this investigation, degeneracies of beams related by symmetry are also illustrated.

45012 **Application of a double-pass CMA to ion scattering from some actinide materials.** Ellis, W.P.; Taylor, T.N. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Vac. Sci. Technol.;* **15**: No. 2, 679-683(Mar 1978).

Surfaces of polycrystalline U, Th, and single-crystalline UO_2(111) have been examined with He^+, Ne^+, and Ar^+ at incident beam energies E/sub i/< or =650 eV. For this study we used a double-pass cylindrical mirror analyzer in a custom vacuum system intended primarily for UPS chemisorption studies. The incident ion beam was perpendicular to the axis of the analyzer. Our approach was to determine if the instrument could serve in a complementary ISS capacity and, if so, what the ion scattering conditions are for detecting both surface oxygen and the actinides. Data are presented illustrating definitive results. But severe limitations in resolution are evident, the energies do not correspond exactly to a simple binary-collision model, and with He^+ the scattering intensities from actinide materials are quite low by comparison with a Au reference.

MECHANICAL PROPERTIES

REFER ALSO TO CITATION(S) 45041

45013 (ORNL—5386) **Thermal ratchetting tests of Type 304 stainless steel pipe: specimens TTT-1 and TTT-2.** Corum, J.M.; Battiste, R.L.; Sartory, W.K.; Smith, J.E.; Young, H.C. (Oak Ridge National Lab., Tenn. (USA)). Jun 1978. Contract W-7405-ENG-26. 116p. AT.

The results of two high-temperature thermal ratchetting tests on straight sections of type 304 stainless steel pipe are presented, and the results are used to evaluate inelastic analysis predictions of the ratchetting behavior. The pipe specimens, each of which was machined from a well-characterized heat of material, were subjected to a series of thermal downshocks on their inner surface, followed by sustained periods under an internal pressure loading at a temperature of 593°C (1100°F). Testing was carried out in a special sodium test facility built for the purpose, and the outer-surface strain histories were measured and compared with inelastic analysis predictions obtained using a one-dimensional finite-element procedure based on inelastic analysis guidelines recommended for use in design of U.S. LMFBR components. The required mechanical property data for the analyses were obtained from specimens of the specific heat of material used for the pipe ratchetting specimens. For one of the two tests, the agreement between experiment and predictions was extremely good, while in the other case the predictions significantly overestimated the measured response.

45014 (SAND—77-8042) **Mechanical properties of sulfamate nickel electrodeposits.** Johnson, H.R.; Dini, J.W.; Stoltz, R.E. (Sandia Labs., Livermore, Calif. (USA)). Mar 1978. Contract EY-76-C-04-0789. 25p. (CONF-780602—1). Dep. NTIS, PC A02/MF A01.

From 65. conference of American Electroplaters' Society; Washington, DC, USA (Jun 1978).

Thickness influences the mechanical properties of nickel electrodeposits at room and at elevated temperatures. Deposits less than 0.07 mm thick exhibit higher ultimate tensile strengths, similar values for reduction in area, and lower elongation than do thicker deposits. Varying the strain rate 3000-fold at room temperature results in a gradual increase in tensile strength but no change in ductility. A noticeable reduction in ductility occurs above 400°C, particularly at normal laboratory strain rates ($1.1 \times 10^{-3}\ s^{-1}$). This reduction in ductility is accompanied by extensive intergranular cavity formation and fracture. Grain boundary fracture can be enhanced by sulfur, and codeposition of manganese is suggested as one means of overcoming the problem. At high strain rates ($4.4 \times 10^{-1}\ s^{-1}$), no ductility losses are encountered. Heating the specimens for 24 hours at test temperature before testing results in only minor changes in the properties as compared with those of unheated deposits. 14 figs., 4 tables.

45015 (TID—28431) **Analysis of the ductile-brittle transition temperature in Fe-binary alloys. Final report, May 1974—July 1977.** Gerberich, W.W. (Minnesota Univ., Minneapolis (USA)). Mar 1978. Contract EY-76-S-02-2212. 11p. Dep. NTIS, PC A02/MF A01.

A systematic study of flow and fracture characteristics in binary alloys of iron as well as other crack growth mechanisms in high strength steel and nickel-based alloys is reported. (GHT)

45016 **Hardness and bounding in A15 superconducting compounds.** Chin, G.Y.; Wernick, J.H.; Geballe, T.H.; Mahajan, S.; Nakahara, S. (Bell Laboratories, Murray Hill, New Jersey 07974). *Appl. Phys. Lett.;* **33**: No. 1, 103-105(1 Jul 1978).

Microhardness of single crystals of V_3Si and V_3Ge as well as polycrystalline Nb_3Ir, Nb_3Au, and Nb_3Sn have been measured. The relatively high ratio of hardness to elastic constant C_44 supports the existence of strong covalency in A_3B compounds of the A15 structure. Correlation with interatomic distance suggests covalent bonding (tight binding) in the A-A chains.

45017 **Self-consistent technique for estimating the dynamic yield strength of a shock-loaded material.** Asay, J.R.; Lipkin, J. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 7, 4242-4247(Jul 1978).

A technique is described for estimating the dynamic yield stress in a shocked material. This method employs reloading and unloading data from a shocked state along with a general assumption of yield and hardening behavior to estimate the yield stress in the precompressed state. No other data are necessary for this evaluation, and, therefore, the method has general applicability at high shock pressures and in materials undergoing phase transitions. In some special cases, it is also possible to estimate the complete state of

stress in a shocked state. Using this method, the dynamic yield strength of aluminum at 2.06 GPa has been estimated to be 0.26 GPa. This value agrees reasonably well with previous estimates.

45018 Temperature dependence of plastic deformation rate in lead at the superconducting transition. Abramov, V.V. (Physicotechnical Institute of Low-Temperature Physics, Academy of Sciences of the Ukrainian SSR, Khar'kov). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 10, 635-637(Oct 1977).

The temperature depenpendence of the ratio of the plastic deformation rates in the S and N states, epsilon-acute-accent/sub s// epsilon-acute-accent/sub n/, has been studied in lead single crystals in the temperature range 1.5—7.2 °K. This dependence has been experimentally shown to be of a different character for various degress of deformation. The experimental data are compared with the deductions which softening theory bases on dynamic dislocation drag by conduction electrons and also with quasistatic models of softening during the N—S transition.

45019 Concentration dependence of the softening effect in Pb—Sn and Pb—Bi alloys at the superconducting transition point. Startsev, V.I.; Abraimov, V.V.; Sollatov, V.P. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 9, 577-583(Sep 1977).

A study has been made of the effects of small amounts of tin and bismuth on the softening effect δε/sub n/s for lead single crystals at the superconducting transition point. Experiment shows that the magnitude of the softening κδε/sub n/s shows a complicated nonmonotonic dependence on the impurity concentration in the superconductor; the measurements are compared with conclusions from existing theories of the effect.

PHYSICAL PROPERTIES

REFER ALSO TO CITATION(S) 44698, 46127

45020 (N—77-34018) **Moessbauer effect studies in iron containing nonmagnetic impurities.** Singh, J.J. (National Aeronautics and Space Administration, Langley Station, Va. (USA). Langley Research Center). Aug 1977. 20p. (NASA-TM—74067). NTIS PC A02/MF A01.

Mossbauer parameters of dilute quaternary (Fe-XYZ) alloys where X, Y, Z, are Al, Ge, and La, respectively were studied. A comparison between the computed and the observed values indicates that changes in effective hyperfine field, outer peak widths and the isomer shift predicted on the basis of binary alloys of the individual impurities are equal, within experimental errors, to those obtained in quaternary (Fe-XYZ) alloys. The effects of simultaneously present dilute impurities are shown to be additive, independent of their respective electronic configurations.

45021 Superconducting properties of in situ prepared Nb-Cu-Sn alloys. Verhoeven, J.D.; Finnemore, D.K.; Gibson, E.D.; Ostenson, J.E.; Goodrich, L.F. (Ames Laboratory: USDOE, Iowa State University, Ames, Iowa 50011). *Appl. Phys. Lett.;* **33**: No. 1, 101-102(1 Jul 1978).

Alloys of Cu—20 wt% Nb have been prepared by a chill casting technique. After drawing to fine wire, Nb_3Sn was formed by plating and diffusion of Sn. The critical-current properties and the resistance to degradation of J/sub c/ upon mechanical deformation both compare favorably to commercial Nb_3Sn tape.

45022 Effect of magnetically aligned powder on the magnetostriction of sintered rare earth—iron Laves phase compounds. Malekzadeh, M.; Pickus, M.R. (Materials and Molecular Research Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Appl. Phys. Lett.;* **33**: No. 1, 108-110(1 Jul 1978).

A powder metallurgical approach is utilized to prepare grain-oriented Laves phase compounds of Tb/sub x/Dy/sub 1-x/Fe_2. The magnetostrains observed in the oriented compounds, though containing ~20% porosity as presently prepared, are far superior to those of arc cast and highly dense liquid-phase sintered materials. Also, it is shown that the alignment achieved is strongly dependent on the Tb/Dy ratio.

45023 Ion-beam investigation of Sb diffusion and solubility in Fe. Myers, S.M.; Rack, H.J. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 6, 3246-3254(Jun 1978).

The diffusion coefficient and solid solubility of Sb in Fe have been measured over the temperature range 773< or =T< or =873 K by ion-beam methods. This has extended previous diffusion-rate data downward by five orders of magnitude. Diffusion couples formed by ion implanting Sb into Fe were vacuum annealed, with composition versus depth being determined by ion backscattering analysis. Precipitation within the implanted region was characterized by transmission electron microscopy. Theoretical analysis of the data is based on coupled differential equations for the concentration profile and the precipitate radii. The resulting solid solubility of Sb in Fe is given by C_0= (22.7 at.%) exp(-1905K/T) for 773< or =T< or =1273 K, where other data from higher temperatures have been included. The diffusion measurements may be described by D= (80 cm^2/s) exp(-32 460K/T) for 773< or =T< or =873 K. Implications of these results for intergranular embrittlement by grain-boundary segregation of Sb are discussed.

45024 Single-crystal elastic constants of Al_2Cu. Eshelman, F.R.; Smith, J.F. (Ames Laboratory: ERDA and Department of Materials Science and Engineering, Iowa State University, Ames, Iowa 50011). *J. Appl. Phys.;* **49**: No. 6, 3284-3288(Jun 1978).

The single-crystal elastic constants of tetragonal Al_2Cu have been measured over the temperature range 4.2—300 K by the pulse-echo-overlap technique. The directly measured constants show a normal monotonic decrease in magnitude with increasing temperature but with C_44 showing the least change. The anisotropy ratios C_33/C_11, C_12/C_13, and C_44/C_66 show only small percentage changes between 4.2 and 300 K, but $2C_44/(C_11-C_12)$ changes by nearly a factor of 2. Comparison of data for Zr_2Ni with that for Al_2Cu indicates some importance of atomic size effects. A Debye temperature of 402 K was evaluated from the elastic constants at 4.2 K.

45025 Bonding in a Cu (001) monolayer. Painter, G.S. (Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev., B;* **17**: No. 10, 3848-3852(15 May 1978).

Results of a first-principles, all-numerical linear variational energy-band calculation are presented for a Cu (001) monolayer. The electronic structure is discussed in terms of the changes in d bonding which accompany the descent in symmetry in going from the bulk to the surface. The relation of the splittings and ordering of the levels to those of the bulk follow expectations based on simple d-bonding considerations. Results are compared with those from other studies and some discrepancies among earlier works are resolved.

45026 Diffuse neutron scattering in Nb-Zr alloys. Wakabayashi, N. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev., B;* **17**: No. 10, 3875-3879(15 May 1978).

The diffuse scattering of neutrons has been observed in the alloys Nb/sub 0.95/Zr/sub 0.05/ and Nb/sub 0.88/Zr/sub 0.12/ along the [111] direction around various reciprocal-lattice points. The intensity profiles were interpreted on the basis of the scattering cross section due to the lattice distortions caused by the substitutional impurity atoms. The observed peak near (3/4) <111> can be related to the longitudinal phonon dispersion curve which has a local minimum near this wave vector.

45027 Hydrogen and deuterium permeation in copper alloys, copper—gold brazing alloys, gold, and the in situ growth of stable oxide permeation barriers. Begeal, D.R. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Vac. Sci. Technol.;* **15**: No. 3, 1146-1154(May 1978).

The deuterium permeation through several copper alloys has been measured over a temperature range of 550 to 830 K using the membrane technique. In some cases, the hydrogen permeability was also measured. The results were divided into three categories: common alloys, gold alloys, and stable oxide forming alloys. Common alloys which showed typical bulk metallic diffusion with litle change in the permeation activation energy as compared to copper (77 kJ/mol for D_2) were: (additions are in weight percent) 5% Sn, 2.3% U, 0.15% Zr, 4% Sn+4% Pb+4% Zn, 3% Si, and 7% Al+2% Fe. Compared to copper, the D_2 permeability at 573 K was reduced by factors of 2.0, 2.7, 4.5, 5.3, 5.9, and 7.0, respectively. A series of gold—copper alloys including pure gold, 80% Au, 50% Au, 49% Au, and 35% Au also showed typical bulk metallic diffusion with a trend of decreasing permeability (increasing activation energies for permeation) with increasing gold content. There were also pronounced inflections or shifts in the permeability at ~370°C, or about the order—disorder transition for Cu_3Au and CuAu, for the 80% and 50% alloys. Two alloys did not exhibit bulk metallic permeation behavior and the permeabiltiy was in fact controlled by surface oxide layers. It was found that a layer of beryllium oxide could be formed on Cu+2% Be and a layer of aluminum oxide could be formed on Cu+7% Al+2% Si. As compared to 0.25 mm-thick copper, the deuterium permeability at 500°C was reduced by a factor of ~250 for Cu—Be and ~1000 for Cu—Al—Si. The activation energies for deuterium permeation were 98 kJ/mol and 132 kJ/mol, respectively. The mechanism for the oxide growth is the high-temperature hydrogen reduction of nearby less stable oxides, simultaneous with oxidation of the active metal, Be or Al, by trace amounts of water in the hydrogen. Ion microprobe mass analysis identified the oxide layers as containing beryllium or aluminum but not containing copper.

45028 Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys. Sereni, J.G.; Huber, J.G.; Luengo, C.A.; Maple, M.B. (Centro Atomico Bariloche (CNESA),

Instituto de Fisica, Balseiro (UNC), Rio Negro, Argentina). *J. Low Temp. Phys.;* **30**: No. 5, 729-737(1 Mar 1978).

Specific heat measurements are reported in detail for the Ce impurity in the superconducting matrix systems Th_65Sc_35Ce, Th_90Y_20Ce, and Th_65Y_35Ce. The variation of the specific heat jump ΔC at the superconducting transition temperature T/sub c/ is indicative of the magnetic nature of an impurity. For Th_65Y_35Ce a departure is found from the BCS law of corresponding states predicted for a nonmagnetic impurity. This departure is correlated with that observed for (La,Th)Ce systems and related to ΔT/sub c//n (initial slope of T/sub c/ vs. n) and Ce effective size (implied by lattice parameter data).

45029 Fermi surface of platinum. Dye, D.H.; Ketterson, J.B.; Crabtree, G.W. (Department of Physics and Materials Research Center, Northwestern University, Evanston, Illinois and Solid State Science Division, Argonne National Laboratory, Argonne, Illinois). *J. Low Temp. Phys.;* **30**: No. 5, 813-838(1 Mar 1978).

We have made measurements of the extremal cross-sectional areas of the open hole surface of the Fermi surface of platinum for the previously unobserved, heavy mass orbits centered on Γ and X with the magnetic field along the [100] and [110] directions, respectively. When combined with previous measurements, the necessary data associated with all classes of orbits on all three sheets of the surface are now available. Using a relativistic non-muffin-tin, Korringa-Khon-Rostoker formalism, data were fitted using the scattering phase shifts associated with the appropriate irreducible relativistic cubic representations as disposable parameters (through l=2) to an accuracy of 0.3%. The resulting radii of all sheets of the Fermi surface are reported. A volume integration yields the necessary charge neutrality for this even-valent metal to within 1%. Next, available cyclotron mass data were fitted using the energy derivatives of the scattering phase shifts as disposable parameters (many-body effects being absorbed in the parameter set) to an accuracy of 3.4%; here the measured total electronic density of states was used as a constraint. The resulting Fermi velocities are also reported.

45030 Effect of primary ion energy and surface chemistry on the secondary ion yields in low-energy SIMS experiments. Yu, M.L. (Brookhaven National Laboratory, Upton, New York 11973). *J. Vac. Sci. Technol.;* **15**: No. 2, 668-671(Mar 1978).

The chemisorption of oxygen on W(100) and Mo(100) single-crystal surfaces was studied using a static mode SIMS technique at primary ion energies ranging from 150 eV to 2 keV. The following secondary ion yields O^-, WO^-_2, and MoO^-_2 were found to be sensitive to the changes in the chemisorbed oxygen layer at different stages of chemisorption. Significant enhancement in the sensitivity of the O^- yield to the chemisorption process was observed when the energy of the Ne^+ primary ion energy was below 500 eV.

45031 Auger study of surface carbon and oxygen on thorium following ion bombardment. Bastasz, R.; Colmenares, C. (General Chemistry Division, Lawrence Livermore Laboratory, P. O. Box 808, Livermore, California 94550). *J. Vac. Sci. Technol.;* **15**: No. 2, 791-793(Mar 1978).

The composition of a thorium metal surface has been monitored using Auger electron spectroscopy following Ar^+ bombardment at different temperatures. After extended Ar^+, bombardment, enough contaminated overlayers were removed to expose a surface region containing only thorium, bulk impurities, and imbedded argon. The main impurities, carbon and oxygen, differed in their behavior when the sample was annealed following bombardment. The amount of surface carbon either increased or remained constant during annealing depending upon the temperature of the sample during bombardment. The amount of surface oxygen decreased rapidly when the sample was heated above 500°C regardless of the sample temperature during bombardment. These experiments indicate that preparation of clean, annealed thorium surfaces requires ion bombardment at temperatures > or =400°C.

45032 Oxidation of the (110) face of a molybdenum single crystal. Zykov, B.M.; Ikonnikov, D.S.; Tskhakaya, V.K. *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 12, 2144-2147(Dec 1977).

The low-energy electron diffraction and contact potential methods were used in an investigation (in better than 10^-10 Torr vacuum) of the oxidation of the (110) face of Mo as a result of isothermal absorption of oxygen in the range 25—1400°C and heating of the resultant structures 100—1700°C. A two-dimensional film of MoO with the (100) face parallel to the substrate plane formed as a result of adsorption at temperatures T/sub ad/=550—750°C and 1000—1300°C. At intermediate temperatures of 750—1000°C both faceted and unfaceted MoO_3 films with the (111) face parallel to the substrate plane were obtained. Crystals of the faceted oxide film were triangular pyramids with the (111) face of MoO_3 as the base and with the (100) faces of MoO_3 as the side surfaces. A two-dimensional MoO_2 film with the (100) face parallel to the substrate plane was obtained at T/sub ad/=700°C and also after heating, at T/sub h/=1120—1180°C, of oxygen films formed adsorbed at T/sub ad/=325—1170°C.

45033 Anisotropy of the electrical resistivity of rare-earth metals. Irkhin, Y.P.; Raevskaya, L.T.; Abel'skii, S.S. (Institute of Metal Physics, Academy of Sciences of the USSR, Sverdlovsk). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 11, 1964-1968(Nov 1977).

Calculations of the anisotropy of the "magnetic" electrical resistivity of heavy rare-earth metals are made for the paramagnetic temperature range. The Coulomb scattering of conduction electrons by the orbital moments of the f shells is considered as an anisotropic scattering mechanism. The Hamiltonian of the Coulomb interaction is derived using anisotropic conduction-electron wave functions. The size of the calculated resisitivity anisotropy, Δp/sub mag//p-bar/sub mag/, is found to be determined by the ratio of the Coulomb interaction to the exchange interaction. The variation of the effect with the position of the element in the series is described by the factor $\alpha^2 J\ (J+1)/(g/\text{sub } J/-1)^2$, where α is the Stevens factor.

45034 Mechanism of lithium diffusion in single-crystal molybdenum. Larikov, L.N.; Isaichev, V.I.; Maksimenko, E.A.; Belkov, B.M. (Institute of Metal Physics, Academy of Sciences of the Ukrainian SSR, Kiev). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 11, 677-679(Nov 1977).

The temperature dependence of Li diffusion in {110}<110> Mo obtained by the floating zone technique was measured for the range 1570-1970°C.

45035 Critical magnetic fields of superconducting compounds based on Nb_3Ge obtained at high pressures and temperatures. Vereshchagin, L.F.; Novikshonov, V.I.; Evdokimov, V.V.; Khlybov, E.P.; Vvedenskii, V.L. (Institute of High Pressure Physics, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 394-396(5 Oct 1977).

Measurements were made of the initial section of the plot of the upper critical magnetic field H/sub c/z-italic of compounds based on Nb_3Ge and produced at high pressures and temperatures. The maximum value of the critical magnetic field at zero temperature is estimated on the basis of these measurements.

45036 Adsorption of lanthanum on the (100) face of a tungsten single crystal. Gupalo, M.S.; Medvedev, V.K.; Smereka, T.P.; Babkin, G.V.; Palyukh, B.M. (I. Franko State University, Lvov). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 10, 1731-1733(Oct 1977).

The contact potential method was used in a study of the adsorption of lanthanum on the (100) face of tungsten in ~10^-11 Torr vacuum. The work function, heat of adsorption, and frequency factor in the Arrhenius equation were determined as a function of the concentration of the adsorbed lanthanum atoms. The work function was found to depend strongly on the substrate temperature in the range 300°K<T< or =1200 °K and the thermal stability of adsorbed lanthanum films was found to be high. The interaction of adsorbed lanthanum atoms on the (100) face of tungsten was investigated.

45037 High-frequency properties of superconducting weak couplings. Vedeneev, S.I.; Motulevich, G.P. (P. N. Lebedev Physics Institute, USSR Academy of Sciences, Moscow). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 10, 1742-1743(Oct 1977).

It is shown that a niobium point-contact junction can operate in a regime such that its current-voltage characteristics correspond to the characteristics of microbridges of high-temperature type-II superconductors. Nb-Nb junctions have in such a regime strongly pronounced nonlinear properties in a wide range of voltages, so that it is possible to observe directly on the current-voltage characteristics very-high-order current steps induced by external radiation.

45038 Energy properties of radioactive electron emission from tantalum. Bobykin, B.V.; Nevinnyi, Y.A.; Chezganova, A.Y.; Yakimovich, V.I. (Institute of Nuclear Physics, Academy of Sciences of the Kazakh SSR, Alma-Ata). *Sov. Phys. - Tech. Phys. (Engl. Transl.);* **22**: No. 10, 1239-1245(Oct 1977).

The energy properties of the radioactive electron emission from a piece of sheet tantalum containing radioactive ^182Ta are studied with a high-resolution electron spectrometer. A method is described for measuring the peak of the energy distribution emitted by this mechanism, E_0, and the half-width of this distribution, Γ. With no external electric field at the emitter surface these quantities are $E_0 \approx 0.2$ eV and $\Gamma \approx 1.0$ eV. There is a characteristic high-energy tail stretching over more than 10 eV. Weak electric fields at the surface strongly affect the values of E_0 and Γ, but not the emission intensity. It is suggested that this emission is due to Auger transitions occurring in the system consisting of the emitter surface layer and atoms adsorbed on it.

45039 Temperature dependence of the anisotropy of thermal expansion of scandium. Sirota, N.N.; Zhabko, T.E. (Institute of Solid State and Semiconductor Physics, Academy of Sciences of the

Belorussian SSR, Minsk). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 10, 587-588(Oct 1977).

An x-ray diffraction technique is used to measure the coefficients of thermal expansion of Sc in the range 78—783°K. the Grueneisen parameter is calculated.

45040 Optical properties of thulium in the 0.06—4.9-eV energy range. Knyazev, Y.V. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 4, 424-426(Oct 1977).

The results of polarimetric measurements of the frequency dispersion of the optical parameters of polycrystalline thulium in the 0.253—20-μm (4.9—0.06-eV) wavelength range at temperatures of 80—450 K are communicated. The special features of the quantum absorption in this region are analyzed with allowance for the calculated band structure of the given metal. It is shown that the interband transitions in thulium begin at energies of ~0.3 eV and cause a sharp rise in the frequency dependence curve of the photoconductivity at $h\omega = 1—3$ eV. The temperature dependence of the effective relaxation frequency, which is determined from experimental data in the ir region, is shown to be linear.

45041 Effect of plastic deformation on low-temperature specific heat and superconductivity of rhenium. Polovov, V.M.; Tulina, N.A.; Gavrilov, N.M. (Institute of Solid State Physics, Academy of Sciences of the USSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 10, 604-609(Oct 1977).

The low temperature (4.2—50 °K) specific heat of plastically deformed rhenium single crystal is studied, and a positive shift in the critical temperature for the superconductive transition ($\delta T/\text{sub c}/\!/T^2/\text{sub c}/\sim 60\%$) is observed. Plastic deformation produces an increase in specific heat which may be characterized by a reduction in the characteristic Debye temperature reaching 6% in greatly deformed specimens. The change in T/sub c/ with plastic deformation may be explained by renormalization of the electron—phonon interaction parameter λ with the aid of the well known McMillan—Hopfield relationship $\lambda = \text{const}/M\langle\theta^2\rangle$ ($v\langle\theta^2\rangle$, mean square phonon frequency; M, atomic mass).

45042 Physical properties of vanadium in the temperature range 4.2—300 °K. Pan, V.M.; Prokhorov, V.G.; Shevchenko, A.D.; Dovgopol, V.P. (Institute of Metal Physics, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 10, 609-612(Oct 1977).

The temperature dependence of the electrical resistivity rho, magnetic susceptibility chi, heat capacity C/sub p/, and Hall constant R_0 are studied in a vanadium single crystal. Anomalies are found in the functions rho (T), R_0(T), and C/sub p/(T) near T/sub a/ = 195 °K. It is proposed that in vanadium there exists a second order phase transition caused by ordering of an interstitial impurity (hydrogen) at T<T/sub a/.

45043 Characteristics of electron spectrum and coupling constants in vanadium. Pan, V.M.; Prokhorov, V.G.; Shevchenko, A.D.; Dovgopol, V.P. (Institute of Metal Physics, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 10, 623-625(Oct 1977).

Experimental data on the magnetic susceptibility, specific heat, positron annihilation, and superconducting transition temperature are used to calculate, by three independent methods, the electronic density of states at the Fermi level, the effective electron mass in the conduction band, the electron—phonon coupling constant, and the Coulomb pseudopotential for vanadium.

45044 Steplike structure produced on the superconducting transition of a tin film by microwave radiation. Latyshev, Y.I.; Nad', F.Y. (Institute of Radioengineering and Electronics, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 6, 354-357(20 Sep 1977).

Experiment has revealed a steplike structure, due to the action of microwave radiation, on the plot of the superconducting transition of a film. It is proposed that the observed structure is due to the disequilibrium and inhomogeneity of the state of this film in the microwave field.

45045 Critical magnetic fields of ultrathin bismuth films. Lazarev, B.G.; Semenenko, E.E.; Tutov, V.I. (Physicotechnical Institute, Academy of Sciences of the Ukrainian SSR, Khar'kov). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 9, 554-556(Sep 1977).

Critical transverse magnetic fields were measured in bismuth films 70 to 18 A thick. It was found that for the temperature range (5—1.8°K) and fields investigated the relation H/sub C/(T) is linear in bismuth layers freshly condensed on a liquid-helium-cooled substrate. The slope dH/sub c//dT increases the film thickness decreases, attaining a value of 95,000 Oe/deg for the thinnest films. This increase is correlated with the increase in film resistivity, i.e., with the reduction in the mean free path of the conduction-band electrons. The value of the factor A obtained from the value of the critical magnetic field for a film about 20 A thick (H/sub C/ $=Ax10^4$ T/sub C/) is 9.5. Thus, in ultrathin bismuth films the critical magnetic field is much higher than the paramagnetic limit. This behavior is explained by the large spin—orbit scattering in freshly-deposited ultrathin bismuth films. When the thickness of the bismuth film decreases from 40 to 10 A, the density of states falls off by approximately a factor of two.

45046 Temperature dependence of the nonequilibrium-field penetration depth in a superconductor. Dmitriev, V.M.; Khristenko, E.V. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 9, 587-588(Sep 1977).

Measurements are reported on the temperature dependence of the step structure in the current—voltage curves for long narrow tin films. Measurements have been made of the temperature dependence of the penetration depth, for nonequilibrium longitudinal electric fields, which defines the quasinormal N region in the S—N current stratification. It is shown that inelastic and elastic collision mechanisms are important, and the predominant one is determined by the difference between the actual temperature T and the critical temperature T/sub c/. An expression is derived that describes closely the observed dependence of δ/sub E/ on the temperature and the specimen parameters. The inelastic relaxation time is estimated as $8x10^{-}$ 10 sec.

45047 Effect of magnetic impurities and pressure on the critical temperature of a superconductor with an AuGa=-type band structure. Palistrant, M.E.; Trifan, A.T. (Institute of Applied Physics, Academy of Sciences of the Moldavian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 8, 473-478(Aug 1977).

The dependence of the critical temperature of the intermetallic compound $AuGa_2$ on pressure and on the concentration of a magnetic impurity is studied here on the basis of the Lifshits model of an electronic transition. The dependence of the critical impurity concentration on the pressure and on the valence difference between impurity and host atoms is also studied.

45048 Voltage jumps in the current—voltage characteristics of superconductive channels. Bezuglyi, E.V.; Bratus', E.N.; Galaiko, V.P. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 8, 491-497(Aug 1977).

A previously developed theory {[V. P. Galaiko, "Critical currents for resistive states in superconductive channels", Zh. Eksp. Teor. Fiz. 66, 379—390 (1974) [Sov. Phys. JETP 39, 181 (1974)]} of the nonlinear response of a superconductor to nonequilibrium longitudinal electric fields is used to study the structure of the resistive state in narrow superconductive channels. The experimentally observed "jumps" in the current—voltage characteristics of tin whiskers are explained.

45049 Vortex pinning on grain boundaries in Pb—In alloys. Vinnikov, L.Y.; Zharikov, O.V.; Kopetskii, C.V.; Moskvin, S.I. (Institute of Solid-State Physics, Academy of Sciences of the USSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 7, 407-411(Jul 1977).

The critical current density J has been studied experimentally as a function of the external magnetic field H, the grain size d, the relative anisotropy $\alpha = \Delta H/\text{sub c}/2/H/\text{sub c}/2$, and the Ginzburg—Landau parameter x in a series of polycrystalline lead—indium alloys containing 1.4, 2.1, 5, 11.8, and 18 at.% In. The dependence of J/sub c/ on 1/d has been found to increase as α increases and x decreases. The results warrant the conclusion that the anisotropy of the superconducting properties is the controlling factor for vortex pinning on grain boundaries. A comparison is made with the calculations of Dew-Hughes and Whitcomb[2] and Shmidt.[4]

45050 High-frequency conductivity of thin single-crystal tungsten wafers in a strong magnetic field. $\nu^{+}\pi\omega\bullet_{37}\Xi Y \cong\rightleftharpoons\cong\rightleftharpoons\rightarrow \approx_3\Omega_5=_7\Omega\beta\Lambda Y\ \xi\rightleftharpoons\cong\rightleftharpoons\ \leqq\kappa\Omega\mu\pi^{+}\pi\Sigma\pi_7\ \Lambda_8\approx=\bullet\mu^{+}{}_5\mu Y\ \cong_{5367}\Delta\bullet \Lambda_9\ \int 5^{+}{}_7\Omega_{57}\mu\ \Lambda_8\ \pi=_7\ <\beta\omega_3{}^{+}\Omega^{+}{}_3\Omega\ \int\int\rightleftharpoons\ \int\Lambda\Xi\rightleftharpoons\ \lambda\rightleftharpoons\ \theta\Lambda' \sqrt{}_7\Delta^{-}\rightleftharpoons\ \approx=\bullet\mu\rightleftharpoons\ \leqq\sim\Omega_9\gamma\rightleftharpoons\ \sqrt{}\omega_3\Omega\mu\gamma\rightleftharpoons\geqq\rightarrow\ {}^3\ni\ \sigma\Lambda\rightleftharpoons\ \forall\ {}^{411}\supset {}^{413}\leqq\lambda\Sigma\gamma\ {}^{1977}\geqq\rightleftharpoons$

The surface impedance Z=R+jX (over the 5—10 MHz frequency range) and the static resistivity rho of thin single-crystal tungsten wafers were studied in relation to the intensity of an external magnetic field and to the surface state of a specimen. The experiments were performed at liquid-helium temperature with wafers which had been cleaned and stored under high vacuum. The changes in Z and rho which occur with increasing surface purity are interpreted here as a result of an increase in the specularity for conduction electrons interacting with the crystal boundary.

45051 Effective fields at diamagnetic impurities in rare-earth metals. Bogdanov, P.V.; Godovikov, S.K.; Kozin, M.G.; Turovtsev, V.V.; Sh'pinel', V.S. (Nuclear Physics Research Institute of the Moscow State University). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1113-1118(Jun 1977).

The hyperfine fields at the nuclei of impurity ^{119}Sn atoms in metallic Tb were measured in the regions of ferromagnetic and antiferromagnetic ordering in the temperature range 4.2—235 °K. A strong deviation (up to 90%) of the plot of the temperature dependence of the hyperfine field from the plot of the spontaneous magnetization of the matrix is observed. A comparison with analogous measurements for the Dy matrix shows that the exchange constants can depend on the helicoid angle α. To explain the temperature anomaly, we consider, besides the previously discussed mechanisms, also a new mechanism connection with the rotation of the moments of the nearest environment of the impurity atom.

45052 Quantum oscillations of thermoelectric power under magnetic breakdown conditions. Egorov, V.S. (I. V. Kurchatov Institute of Atomic Energy). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1161-1168(Jun 1977).

Giant quantum oscillations of the thermoelectric power were observed in single-crystal samples of beryllium, zinc, magnesium, and aluminum in liquid helium under magnetic breakdown conditions when the samples were heated with electric current of ~0.1 A. The magnetic frequency corresponds to the extremal sections of the Fermi surface, and the phase of the oscillations is shifted by one quarter of a period relative to the Shubnikov—de Haas oscillations. The experimental results are compared with the theory of Blatt et al. (Phys. Status Solidi (a) 24, 621, 1974).

CORROSION AND EROSION

REFER ALSO TO CITATION(S) 44031, 44049, 44685, 44695

45053 (FE—2299-15) **Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June—31 August 1977.** Perkins, R.A.; Bhat, M.S. (Lockheed Palo Alto Research Labs., Calif. (USA); California Univ., Berkeley (USA)). 10 Nov 1977. Contract EX-76-C-01-2299. 40p. Dep. NTIS, PC A03/MF A01.

A preliminary evaluation of the two most promising compositions for an improved sulfidation resistant alloy has been completed. An Fe—^{17}Cr—^{3}Si provides good resistance to sulfidation in ERDA/MPC gasification atmosphere with 0.5 to 1.0% H_2S at 1800°F. No internal sulfidation was detected under steady state or cyclic heating conditions to 1000 hr exposure. The alloy, however, is susceptible to localized oxidation attack and develops pits 1 to 1.5 mil deep in 1000 hr. External sulfidation occurs as a result in these areas and the alloy is close to failure at 1000 hr. The addition of 1% Hf and 1 to 2% Mo had no effect on behavior. Fe—Cr—Si alloys in this composition range are considered to have little potential for long term service under these conditions. Fe—Cr—Al alloys with 16 to ^{18}Cr, 4 to ^{6}Al, 0 to ^{2}Mo, and ^{1}Hf provide equally good resistance to 1000 hr and beyond and are considered to have good potential for longer term service. No internal sulfidation was detected in 1000 hr at 1800°F under cyclic or steady state heating conditions. The 1% Hf addition is essential to the cyclic use of these alloys and results in the formation of protective alumina scales that do not spall on cooling. The lower Cr(16%) compositions wear out and sulfidize in about 1000 hr and a minimum of ^{18}Cr appears to be required for long term service. An alloy of Fe—^{18}Cr—^{5}Al—^{2}Mo—^{1}Hf has better resistance to sulfidation in the ERDA/MPC gas with 0.5 to 1% H_2S than either 310SS or Ni—^{50}Cr. Assuming a linear rate of reaction, the mils/year penetration is 13 to 21 for the Fe—Ni—Cr and Ni—Cr alloys and 7 for the Fe—Cr—Al—Mo—Hf alloy. This composition meets the program objective of less than 20 MPY penetration under these conditions with a low Cr, Ni-free alloy.

45054 (ORNL-tr—4622) **Potentiostatic study on anodic behavior of iron—chromium alloys.** Shiobara, K.; Sawada, Y.; Morioka, S. Translated by H. Kubota from *J. Jpn. Inst. Met.;* **27**: No. 9, 419-422(1963). 8p. Dep. NTIS, PC A02/MF A01.

The anodic behaviour of seventeen annealed iron-chromium alloys ranging in composition from 0 to 100% Cr in deaerated sulphuric acid solution at 25°C was investigated systematically. The semiconductor type potentiostat was used for polarization measurement. A number of properties such as spontaneous or corrosion potential, passivation potential, Flade potential, initial and secondary maximum corrosion currents (passivation current), passive current, and trans-passive current were compared with the change in composition of alloys. It has been found that the alloys with more than 22% Cr give a negative loop in anodic polarization curve at potential range between -0.4 volt and 0 volt (vs S.C.E.), indicating that these alloys, in this potential range, become spontaneously passive due to oxidation of the hydrogen ion.

RADIATION EFFECTS

45055 (COO—3158-62) **Direct observation of the point-defect structure of depleted-zones in ion-irradiated metals.** Wei, C. (Cornell Univ., Ithaca, N.Y. (USA). Dept. of Materials Science and Engineering). Jan 1978. Contract EY-76-S-02-3158. 276p. NTIS MFA01. Thesis. Portions of document are illegible.

The point-defect structure of individual depleted zones has been studied systematically. Four-pass zone-refined tungsten field-ion microscope (FIM) specimens were irradiated in-situ at 10 K with 30 keV Cr^+, Mo^+, or W^+ ions to a total dose of (2 to 10) x 10^{12} ion cm^{-2} and examined by the pulse field-evaporation technique at 10 K. The experimental conditions were such that each depleted zone was created by a single incident-ion. The number of vacant lattice sites within a depleted zone was compared with a modified Kinchin—Pease model. The radial distribution function was determined for each depleted zone; it was found that the vacant lattice sites within the volume of each depleted zone tended to exist in a highly clustered state. It was found that the diameter D of each depleted zone was described by the equation D approximately equal to [y²]/sup ½/ where [y²]/sup ½/ is the second moment of the theoretical distribution curve, of the fraction of incident ion energy deposited in atom motion, transverse to the direction of the incident ion-beam. The spatial distribution of self-interstitial atoms (SIAs) in a specimen irradiated with 30 keV Cr^+ ions and in a specimen irradiated with 18 keV Au^+ ions, at 10 K, was determined. A low bound to the average range of replacement collision sequences (RCSs) was found to be 175 +- 85 A. A detailed FIM study was also made of the vacancy structure of a (220) platelet created by a single 30 keV W^+ ion in a platinum-4.0 at. % gold alloy; the specimen was irradiated at 40 K and then isochronally warmed to 100 K. The (220) platelet was found to consist of 31 vacant lattice sites, lying in four (220) planes, and clustered in a disc-shaped region which is approximately 20 A in diameter. It was suggested that prismatic dislocation loops lying on (220) type planes in ion or fast neutron irradiated platinum can form as a result of the direct collapse of (220) type vacancy platelets.

45056 Growth kinetics and 'preference factor' of Frank loops in nickel during electron irradiation. Yoo, M.H.; Stiegler, J.O. (Oak Ridge National Lab., Tenn. (USA)). *Philos. Mag.;* **36**: No. 6, 1305-1315(Dec 1977).

The growth kinetics of interstitial-type Frank loops of high purity Ni at 450°C has been measured during electron irradiation in a HVEM operating at 650 kV. The depth positions of the loops with respect to the foil surfaces were determined by stereomicroscopy. The experimental data were analysed by use of the general rate-theory model which takes into account both temporal and spatial dependence of loop growth. It is found from systematic variations of the vacancy migration energy, E/sub v//sup m/, and the preference factor of dislocation loops for self-interstitials, delta/sub i/, that E/sub v//sup m/ = 1.2 eV and delta /sub i/ = 0.06, which together yield reasonable agreement between the theoretical model and the experimental data.

45057 Critical-current changes in neutron-irradiated Nb_3Sn as a function of irradiation temperature and initial metallurgy. Brown, B.S.; Blewitt, T.H.; Scott, T.L.; Wozniak, D.G. (Materials Science Division, Argonne National Laboratory, Argonne, Illinois 60439). *J. Appl. Phys.;* **49**: No. 7, 4144-4148(Jul 1978).

Fast-neutron irradiations have been performed on Nb_3Sn wires to determine the roles of irradiation temperature and the unirradiated value of the critical-current density (J/sub c/0) on the changes in J/sub c/. Four experiments were performed: low- (6 K) and high- (350 K) temperature irradiation of high- (2 x 10^{10} A/cm² at 5 T and 4.2 K) and moderate- (0.8 x 10^{10} A/cm²) J/sub c/0 material. The large increases in J/sub c/ for the moderate-J/sub c/0 material were independent of irradiation temperature; the increases were smaller for the high-J/sub c/0 material, and a significant difference was found for the two irradiation temperatures. The difference is attributed to the greater pinning capability of defect cascades over defect clusters in the high-J/sub c/0 material. The smaller amount of J/sub c/ recovery after a 300 K anneal, when compared with NbTi, can also be understood in terms of the defects responsible for the flux pinning.

45058 Excited state formed by B^+ impact on metallic Cu and Mo. Thomas, E.W.; Inouye, H.; Rausch, E.O. (School of Physics, Georgia Tech, Atlanta, Georgia 30332). *J. Appl. Phys.;* **49**: No. 5, 2911-2915(May 1978).

Impact of 60—200-keV B^+ ions on polycrystalline Cu and Mo targets gives rise to emission from backscattered excited Be and B^+. The emission coefficients for these lines are presented as a function of impact energy and analyzed to provide a measure of the survival parameter A/a for the atom or ion recoiling from the target. For B recoiling from both Cu and Mo, this is found to be 1.3 x 10^8 cm/sec, while for recoiling B^+, it is 2.4 x 10^8. In the case of recoiling B^+, the radiationless deexcitation must be by the Auger mechanism. Emission coefficients for the 3247, 3274-A Cu I doublet are also presented and rise slowly throughout the energy range studied.

45059 Study of radiation damage in metals by positron annihilation. Gauster, W.B. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Vac. Sci. Technol.;* **15**: No. 2, 688-696(Mar 1978).

Positron annihilation is a sensitive technique for probing defects in metals and it has recently been shown to be a valuable tool for the study of radiation damage. After an introduction to the three basic experimental methods (angular correlation, Doppler broadening, and lifetime measurements), the interaction of positrons with lattice defects is reviewed. Results for the annealing of damage after low-temperature irradiation are used to show that positron annihilation has provided new information on annealing kinetics. The role of positron techniques in characterizing complex defect structures resulting from high-temperature neutron irradiation is reviewed and the possible utility of positron annihilation as a nondestructive monitor of property changes is pointed out.

45060 Surface damage of molybdenum and TZM alloy under D^+ impact. Das, S.K.; Kaminsky, M.; Dusza, P. (Argonne National Laboratory, Argonne, Illinois 60439). *J. Vac. Sci. Technol.;* **15**: No. 2, 710-713(Mar 1978).

The surface damage of polycrystalline molybdenum and TZM alloy under 40-, 60-, and 120-keV D^+ impact has been investigated for irradition in both pulsed and continuous modes for total doses varying from 1.7 x 10^{17} to 2.2 x 10^{19} ions/cm^2 and for target temperature varying from ambient temperature to 400° C. Analysis by scanning electron microscopy of the Mo samples held at ambient temperatures during D^+ irradiations in both pulsed and continuous modes revealed surface damage due to blistering for the 40- and 60-keV irradiations for doses ranging from 8.7 x 10^{17} to 8.1 x 10^{18} ions/cm^2, but no detectable damage for the 120-keV D^+ irradiations for doses ranging from 4.3 x 10^{18} to 2.2 x 10^{19} ion/cm^2. This observed difference in the blistering behavior is attributed to the difference in the ambient target temperature for the 120-keV irradiation and both the 40- and 60-keV irradiations. For irradiations at temperatures above 300° C, no blisters could be detected for any of the three energies. For similar irradiation conditions, TZM alloy showed a reduction in blistering as compared to molybdenum.

45061 Kinetics of accumulation of radiation defects in p-type germanium irradiated with 30 and 660 MeV protons. Pokatilo, Y.M.; Urenev, V.I.; Yavid, V.Y. (Scientific-Research Institute of Applied Physics Problems at the V. I. Lenin Belorussian State University, Minsk). *Sov. Phys. - Semicond. (Engl. Transl.);* **11**: No. 1, 97-98(Jan 1978).

Irradiation produced defects with a level E/sub v/+0.25 +-0.02 eV. An investigation of the isochronous annealing established that the radiation defects were removed and the lifetime was restored in a single annealing stage 120-160°C. It was concluded that irradiation of p-type germanium with high-energy protons produced; stable multivacancy complexes.

CERAMICS, CERMETS, AND REFRACTORIES

PREPARATION AND FABRICATION

REFER ALSO TO CITATION(S) 44259, 44261, 44851

45062 Dependence of the index of refraction and microporosity of zirconium dioxide films on the deposition conditions. Muranova, G.A; Fadeeva, E.I.; Perveev, A.F. *Sov. J. Opt. Technol. (Engl. Transl.);* **44**: No. 11, 682-683(Nov 1977).

The effect of the pressure in the vacuum chamber and the condensation rate on the refractive index and microporosity values of zirconium dioxide films, obtained by the method of electron-beam evaporation in vacuum, is examined. Recommendations are given with regard to producing films with optimal parameters.

STRUCTURE AND PHASE STUDIES

REFER ALSO TO CITATION(S) 44851, 45010, 45012

45063 Combined low-energy ion scattering and x-ray photoelectron spectroscopy study of Ta_2O_5 bombarded by 500—3000-eV He ions. Nelson, G.C. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Vac. Sci. Technol.;* **15**: No. 2, 702-705(Mar 1978).

The low-energy ion backscattering spectra of Ta_2O_5 obtained with He as the probe gas exhibit a pronounced low-energy tail on the metal peak and a strong incident ion energy dependence of the oxygen to tantalum peak intensity ratio. To determine the effect differential scattering cross sections, ion neutralization, and sample reduction have on these spectral features, a combined ISS—XPS study has been carried out. The data indicate that the sample is not reduced by the He ion beam and that a resonant-type neutralization plays a dominant role both in tailing and in the variation of the oxygen to tantalum peak intensity ratio.

45064 Low-temperature NMR investigation of zirconium hydride. Naskidashvili, I.A.; Sharimanov, Y.G.; Vilcu, N.; Demco, D.; Simplaceanu, V. (Institute of Physics, Academy of Sciences of the Georgian SSR, Tbilisi). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 11, 2026-2027(Nov 1977).

The temperature dependences of the spin-spin and spin-lattice relaxation times of H in ZrH/sub 1.65/ and ZrH/sub 1.75/ were found in the temperature range 80—300 °K. (AIP)

MECHANICAL PROPERTIES

REFER ALSO TO CITATION(S) 44041, 44042

45065 (COO—1591-32) **Impurity effects on the creep of polycrystalline magnesium and aluminum oxides at elevated temperatures. Technical progress report, December 19, 1976—December 18, 1977.** Gordon, R.S. (Utah Univ., Salt Lake City (USA). Dept. of Materials Science and Engineering). Dec 1977. Contract EY-76-S-02-1591. 48p. (UTEC-MSE—77-216). Dep. NTIS, PC A03/MF A01.

The research described covers work on: 1. The effect of mixed transition metal (Mn-Ti) impurities on the creep of polycrystalline alumina. 2. Stress relaxation deformation which includes work on (a) the design and construction of an improved experimental apparatus (b) the analysis of stresses and strains in stress relaxation tests and (c) preliminary stress relaxation tests at 1350-1450°C on iron-doped (0.53 cation %), polycrystalline MgO.

45066 (N—77-33348) **X-ray photoelectron spectroscopy study of radiofrequency-sputtered titanium carbide, molybdenum carbide, and titanium boride coatings and their friction properties.** Brainard, W.A.; Wheeler, D.R. (National Aeronautics and Space Administration, Cleveland, Ohio (USA). Lewis Research Center). Oct 1977. 21p. (NASA-TP—1033; E—9102). NTIS PC A02/MF A01.

Radiofrequency sputtered coatings of titanium carbide, molybdenum carbide and titanium boride were tested as wear resistant coatings on stainless steel in a pin on disk apparatus. X-ray photoelectron spectroscopy (XPS) was used to analyze the sputtered films with regard to both bulk and interface composition in order to obtain maximum film performance. Significant improvements in friction behavior were obtained when properly biased films were deposited on deliberately preoxidized substrates. XPS depth profile data showed thick graded interfaces for bias deposited films even when adherence was poor. The addition of 10 percent hydrogen to the sputtering gas produced coatings with thin poorly adherent interfaces. Results suggest that some of the common practices in the field of sputtering may be detrimental to achieving maximum adherence and optimum composition for these refractory compounds.

45067 (N—77-33929) **Weibull characterization for tensile fracture of multicomponent brittle fibers.** Barrows, R.G. (National Aeronautics and Space Administration, Cleveland, Ohio (USA). Lewis Research Center). 1977. 30p. (NASA-TM—73790; E—9357). NTIS PC A03/MF A01.

A statistical characterization for multicomponent brittle fibers in presented. The method, which is an extension of usual Weibull distribution procedures, statistically considers the components making up a fiber (e.g., substrate, sheath, and surface) as separate entities and taken together as in a fiber. Tensile data for silicon carbide fiber and for an experimental carbon-boron alloy fiber are evaluated in terms of the proposed multicomponent Weibull characterization.

45068 Elastic properties of a lithia-alumina-silica glass-ceramic at high pressure. Fritz, I.J. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 8, 4423-4426(Aug 1978).

Ultrasonic measurements have been made on a commercial glass-ceramic (Corning Pyroceram 9608) at high pressure. Pulse transit-time data taken at room temperature and at pressures up to 2.6 GPa (26 kbar) have been analyzed to determine the pressure dependences of the sample strain and various elastic parameters. Anomalous behavior is observed, with all the elastic parameters decreasing as a function of pressure up to ~2.4 GPa and, thereafter, increasing with increasing pressure. Direct strain-gauge measurements are in agreement with the results obtained from the analysis of the ultrasonic data. The possibility that the anomalous behavior is caused by a pressure-induced phase transition is discussed.

PHYSICAL PROPERTIES

45069 Electrical response of a slim-loop-ferroelectric ceramic compressed by shock waves. Lysne, P.C. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 7, 4296-4297(Jul 1978).

Shock reverberation experiments were performed on electrically biased specimens of the slim-loop-ferroelectric ceramic (Pb/sub 0.715/Ba/sub 0.285/)/sub 0.991/(Zr/sub 0.707/Ti/sub 0.293/) /sub 0.981/Bi/sub 0.019/O_3, and a simple model was fitted to the observed electrical response. It was found that the material could be described as a linear reversible dielectric and that the reciprocal of the permittivity is linearly related to the shock stress.

45070 Nature of the electric field and the resulting voltage in axially loaded ferroelectric ceramics. Brown, W.T.; Chen, P.J. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 6, 3446-3450(Jun 1978).

We investigate the electric field produced in a ferroelectric ceramic disk polarized in the axial direction when it is subjected to uniform transient loading over one of its planar surfaces. It is shown that the structure of the electric field depends on the instantaneous piezoelectric response, the degradation of the piezoelectric response due to the time dependent effects of depoling, and the structure of the mechanical disturbance. For the situation when electric field-strain relaxation is much faster than stress-strain relaxation, the voltage obtained by integrating the calculated electric field is in excellent qualitative agreement with the observed behavior of PZT 65/35.

45071 Rotation of the plane of polarization in EuO subjected to very high magnetic fields. Tatsenko, O.M.; Druzhinin, V.V.; Pavlovskii, A.I.; Samokhvalov, A.A.; Loshkareva, N.N. (Engineering-Physics Institute, Moscow). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 12, 2079-2081(Dec 1977).

An experimental study was made of the optical Faraday effect in EuO films subjected to magnetic fields reaching 200 T (2 MG). This produced a very large specific rotation exceeding 10^7 deg/cm, which was due to the saturation of the magnetic moment of the ground state of Eu^{2+} and splitting of the conduction band into Landau sublevels. One sample exhibited a change in the rate of rise of the Faraday rotation angle with the field in the region of 45—50 T, which was attributed to a semiconductor—metal transition.

45072 Electrotransport in a ceramic based on thorium oxide. Reetts, T. *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 10, 1683-1685(Oct 1977).

A description is given of a method for using electrotransport in a ceramic based on thorium oxide to determine the charge and diffusion coefficients of impurity ions and to classify the diffusing elements into certain groups. At 1580 °C the application of an electric field (2 V) causes Pt, Rh, Ru, Os, Tc, Mo, and Nb migrate to the anode and Be, Sr, Ba, and Ra to the cathode.

45073 Electronic properties of transition metal dioxides. Kuz'min, E.V.; Ovchinnikov, S.G. (L. V. Kirenskii Institute of Physics, Siberian Branch, Academy of Sciences of the USSR, Krasnoyarsk). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 10, 1752-1757(Oct 1977).

The regularities in the changes in the electrical and structural properties of transition metal dioxides as their d band is filled are explained in terms of the two-band model. A model calculation of the Fermi surface of MoO_2 and WO_2 is also made.

45074 Electron energy losses and ion polarizability in certain transition-metal oxides. Balabanova, L.A.; Stepin, E.V. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 10, 1766-1768(Oct 1977).

The energy-loss spectra were measured for 20 keV electrons which had passed through films of transition-metal oxides (Sc_2O_3, TiO_2, Cr_2O_3, MnO, Mn_3O_4, Co_3O_4, NiO, Sm_2O_3, EuO, Eu_2O_3, Ho_2O_3, Yb_2O_3, and UO_2). The optical functions were calculated from the spectra. The loss peaks are identified according to the types of excitation. The shift in the observed value of bulk plasmon energy from the theoretical figure for a free electron gas is used to determine the electron molar polarizability of the oxides. The molar values are then used to calculate the electron polarizability of the ions.

45075 Superconductivity in two-component compounds. The isotope effect in PdH. Morozov, A.I. (Physicotechnical Institute, Moscow). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 7, 404-407(Jul 1977).

The isotope effect is considered for intermediate-coupling superconducting compounds. An additional contribution to the effect is found, which is absent in pure superconductors. For PdH the expression for T/sub c/ agrees with the inverse isotope effect observed when hydrogen is substituted by deuterium.

RADIATION EFFECTS

REFER ALSO TO CITATION(S) 44657

POLYMERS AND PLASTICS

STRUCTURE AND PHASE STUDIES

REFER ALSO TO CITATION(S) 45078, 45079

MECHANICAL PROPERTIES

45076 (UCRL—80390) **Effect of simultaneous and sequential detonation on explosive-induced fracture.** Swift, R.P.; Schatz, J.F.; Durham, W.B.; Hearst, J.R.; Kusubov, A. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 3 Mar 1978. Contract W-7405-ENG-48. 9p. (CONF-780509—5). Dep. NTIS, PC A02/MF A01.

From 19. symposium on rock mechanics; Lake Tahoe, NV, USA (1 May 1978).

Tests were conducted in samples of polystyrene to study the effects of detonation delay on explosively induced fracturing. Two explosive charges in separate emplacement holes were fired at several choices of delay. The effect of free surfaces was minimized to make the experiments a study of blast-induced fracturing in a confined mode, i.e., deeply buried. All fractures formed on radial planes with respect to the emplacement holes. Simultaneous firing connected emplacement holes and produced fractures strongly oriented in the plane of the holes. Delayed firings in the second hole tended to suppress fracturing in the general direction of the first shot hole but to enhance fracturing away from the first hole. The effect was most dramatic in the "medium" delay firings; i.e., where the delay time was comparable to the dilatational wave transit time between holes. Using total surface area of cracks as a measure of damage, it was found that no choice of delay, including zero delay, could enhance the per-hole damage above that produced by an isolated shot. For medium delays, in fact, the total damage was measurably reduced.

45077 Acoustical determination of the shear relaxation functions for polymethyl methacrylate and Epon 828-Z. Sutherland, H.J. (Sandia Laboratories, Albuquerque, New Mexico 87185). *J. Appl. Phys.;* **49**: No. 7, 3941-3945(Jul 1978).

A differential-path ultrasonic technique is used to obtain the acoustic propagation characteristics of shear waves in polymethyl methacrylate (PMMA) and Epon 828-Z. The acoustic velocity and attenuation are measured at 0.5, 1, and 2 MHz over a temperature range of -60 to 70 °C. Time-temperature superposition is used to transform these data into their "master curve" form. Using this representation, the shear-stress relaxation modulus is then deduced and combined with the previously determined longitudinal data to form a complete characterization of the short-time linear response of these two homogeneous and isotropic viscoelastic polymers.

PHYSICAL PROPERTIES

45078 (UCRL—50019-77-1) **Organic Materials Division quarterly report, January—March 1977.** Lepper, J.K. (ed.). (California Univ., Livermore (USA). Lawrence Livermore Lab.). 19 Jan 1978. Contract W-7405-ENG-48. 17p. Dep. NTIS, PC A02/MF A01.

Progress is reported on research in fiber composite technology, fiber reinforced flywheels, and explosives technology. Abstracts were prepared for each of the three areas for the data base. (GHT)

45079 (UCRL—50019-77-1, pp 1-2) **Fiber composite technology.** 19 Jan 1978.

In Organic Materials Division quarterly report, January—March 1977.

Progress is summarized in spectroscopic studies of Kevlar fiber and composites, and physicochemical properties of Kelvar 49 fiber. (GHT)

45080 Piezoelectricity and pyroelectricity in polyvinylidene fluoride. Kepler, R.G.; Anderson, R.A. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 8, 4490-4494(Aug 1978).

The piezoelectric, thermal expansion, and elastic coefficients of two different types of polyvinylidene fluoride film have been measured and used to calculate the secondary pyroelectric coefficient. It is found that secondary pyroelectricity can account for about half the pyroelectricity observed.

OTHER MATERIALS

PREPARATION AND MANUFACTURE

REFER ALSO TO CITATION(S) 44356, 44507, 45091

STRUCTURE AND PHASE STUDIES

45081 One-dimensional fluctuations and the chain-ordering transformation in Hg/sub 3-delta/AsF_6. Emery, V.J.; Axe, J.D. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev. Lett.;* **40**: No. 23, 1507-1511(5 Jun 1978).

Neutron-scattering behavior and other properties of the mercury chains in Hg/sub 3-delta/AsF_6 are calculated from a simple

microscopic model. The independent chains satisfy a quantum sine-Gordon equation. The theory accounts for existing observations and makes a number of testable predictions about properties of the disordered phase, the nature of the phase transition, evolution of long-range order, and the excitation spectrum at low temperatures.

45082 Small-angle x-ray scattering from oriented ellipsoidal voids in pyrolytic graphite. Bose, S.; Bragg, R.H. (Materials and Molecular Research Division, Lawrence Berkeley Laboratory and Department of Materials Science and Minerals Engineering, University of California, Berkeley, California 94720). *J. Appl. Phys.;* **49**: No. 5, 2916-2918(May 1978).

Small-angle x-ray scattering from oriented voids in pyrolytic graphite has been studied. The scattering is found equivalent to that from a dilute dispersion of ellipsoids of revolution called "Guinier spheres" of radius of gyration R=(3/5) H]/sup 1/2/=(3/5)(a² sin²γ+b² cos²γ)]/sup 1/2/, where γ is the angle between the common axis of revolution (semiminor axis b) and the scattering vector h. Analysis of the data using Hamzeh and Bragg's theory provides values of a, b, and a/b from the "Guinier" and the "Porod" regions, independently, with good agreement. The theoretically predicted angular dependence of H using "best-fit" values of a and b is in good agreement with the experimentally determined value of H, γ varying from 0° to 180°.

45083 Interface states at the Ga—GaAs interface. Bachrach, R.Z.; Bianconi, A. (Xerox Palo Alto Research Center, Palo Alto, California 94304). *J. Vac. Sci. Technol.;* **15**: No. 2, 525-528(Mar 1978).

A variable-excitation energy photoemission study has been made of the occupied states near the Ga—GaAs (110) interface as the interface is formed. Using a combination of valence and core-level spectroscopy, new aspects of the interface electronic structure have been deduced. Using valence-band spectroscopy, interface states are found to appear as the Ga film is built up. Using core-level spectroscopy, one finds chemical shifts in both the Ga and As 3d levels. The As shift indicates that surface charge redistribution from the As to the Ga occurs at the interface.

45084 (ANL-Trans—1130) **Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals.** Kanadero, U.K.; Bogano, Ya.R. Translated from *Uch. Zap., Latv. Gos. Univ.;* **234**: 59-75(1975). 20p. Dep. NTIS, PC A02/MF A01.

The possibilities of using tunnel luminescence as a probe of the spatial distribution of defects are discussed. It is shown that fractional photostimulated tunnel luminescence can be used to determine the spatial distribution of defects, between which recombination of tunnel pairs is not observed immediately after their creation. The frequency characteristics of the fractional photostimulated tunnel luminescence are used to evaluate the phenomenological parameters characterizing the efficiency of the generation and radiation of tunnel pairs. The mutual spatial distribution of Tl^+ and V/sub k/ centers and certain features of the electron step of the mechanism of the generation of [Tl^0 - V/sub k/] pairs in KCl-Tl are investigated.

PROPERTIES

REFER ALSO TO CITATION(S) 44041, 44657

45085 (AED-Conf—1977-197-009) **Contact electrification of dielectric solids.** Fuhrmann, J. (Kaiserslautern Univ. (Germany, F.R.). Fachbereich Chemie). 1977. 20p. (CONF-7706113—3). Dep. NTIS (US Sales Only), PC A02/MF A01.

From DECHEMA annual meeting; Frankfurt am Main, F.R. Germany (23 Jun 1977).

The main questions of the basic concept dealing with contact electrification of dielectric solids are summarized. Recent results which have a direct bearing to static electrification of polymer solids are reviewed. Differences between equilibrium contact electrification, transient contact electrification, and steady state contact electrification are discussed. An analog model of the dynamics of charge exchange between metal and polymer is used to illustrate these differences.

45086 Additive coloration of sapphire. Lee, K.H.; Crawford, J.H. Jr. (Department of Physics and Astronomy, University of North Carolina, Chapel Hill, North Carolina 27514). *Appl. Phys. Lett.;* **33**: No. 4, 273-275(15 Aug 1978).

F-type centers have been introduced in to single crystals of α-Al_2O_3 by heating them at 2000 °C in a graphite crucible under strongly reducing conditions. This treatment produces results similar to additive coloration in that anion vacancies charge compensated by electrons are introduced as demonstrated by the presence of a 6.1-eV optical absorption band after heating. Although the same band can be created by high-energy-particle bombardment; by contrast those resulting from this additive coloration procedure are very stable against thermal annealing. Annealing above 1400 °C in air is necessary to produce a decrease in the 6.1-eV-band amplitude. The 6.1-eV band has been related to the F center in our previous study. This study further substantiates this model.

45087 Laser annealing of diffusion-induced imperfections in silicon. Young, R.T.; Narayan, J. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Appl. Phys. Lett.;* **33**: No. 1, 14-15(1 Jul 1978).

High-temperature diffusion of boron or phosphorus into silicon leads to the formation of spherical precipitates and/or dislocation loops in the diffused layer which influence electrical junction characteristics. These diffusion-induced imperfections can be removed by high-energy pulse laser treatment. The boron or phosphorus atoms previously contained in the precipitates become electrically active and the resulting dopant concentration can exceed the solid solubility limit.

45088 SIMS analysis of deuterium diffusion in hydrogenated amorphous silicon. Carlson, D.E.; Magee, C.W. (RCA Laboratories, Princeton, New Jersey 08540). *Appl. Phys. Lett.;* **33**: No. 1, 81-83(1 Jul 1978).

Secondary ion mass spectroscopy (SIMS) has been used to measure the diffusion of deuterium in hydrogenated amorphous silicon. For a film deposited in a dc glow discharge in SiH_4 at a substrate temperature of 315 °C, the diffusion data fits D (T) =1.17 x 10⁻2 exp(-1.53 eV/kT) cm²/s. This result implies that degradation of these films due to hydrogen out-diffusion at 100 °C will not be significant until after more than 10^4 years.

45089 Electrical properties of Al_2O_3 under isentropic compression up to 500 GPa (5 Mbar). Hawke, R.S.; Duerre, D.E.; Huebel, J.G.; Keeler, R.N.; Wallace, W.C. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *J. Appl. Phys.;* **49**: No. 6, 3298-3303(Jun 1978).

The magnetic compression technique was used to measure the electrical properties of Al_2O_3 during isentropic compression. Details of the experiment are described. This compound remained an electrical insulator up to at least 500 GPa (5 Mbar). Comparisons are made between these results and other dynamic and static compression data.

45090 Magneto-optical properties of KTb_3F_{10} and $LiTbF_4$ crystals. Weber, M.J.; Morgret, R.; Leung, S.Y.; Griffin, J.A.; Gabbe, D.; Linz, A. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *J. Appl. Phys.;* **49**: No. 6, 3464-3469(Jun 1978).

Single crystals of KTb_3F_{10}, $LiTbF_4$, LiTb/sub 0.5/Y/sub 0.5/F_4 and LiTb/sub 0.25/Gd/sub 0.75/F_4 were prepared and the wavelength, temperature, and magnetic field dependence of the Faraday rotation measured. Optical-absorption spectra and refractive indices are also reported. The Faraday effect in these materials is described by a paramagnetic rotation with the primary oscillator strength arising from $4f^8 \rightarrow 4f^7 5d$ electronic transitions of the Tb^3+ ions. Whereas $LiTbF_4$ orders ferromagnetically at low temperatures, the mixed crystals exhibited no ordering at T> or =1.25 K. Low-temperature Faraday rotation measurements of KTb_3F_{10} do not indicate ferromagnetic order above 1.66 K. KTb_3F_{10} and $LiTbF_4$ crystals have large Verdet constants, are transparent in the visible and near infrared and have small nonlinear refractive-index coefficients. These materials are therefore useful for optical rotators and in high-power laser applications.

45091 Self-diffusion processes in nuclear carbonitrides UC/sub x/N/sub 1-x/ and $(U,Pu)C_{0.8}N_{0.2}$. Matsui, H.; Bradbury, M.H.; Matzke, J. (Inst. for Transuranium Elements, Karlsruhe, Ger.). *Nucl. Sci. Eng.;* **66**: No. 3, 406-414(Jun 1978).

The self-diffusion of ^{14}C and ^{233}U in four different uranium carbonitrides, UC/sub x/N/sub 1-x/ with x = 0.67, 0.26, 0.24, and 0.18, and the diffusion of ^{238}Pu in two sets of $(U,Pu)C_{0.8}N_{0.2}$ were measured. Replacing carbon by nitrogen decreased self-diffusion rates in both metal and non-metal lattices. The decrease was not linear with x; rather, a change in mechanism or bonding at around x approximately equal to 0.5 was indicated. The data are of importance for both fabrication and reactor operation of carbonitrides.

45092 Resonance Raman studies in Cu_2O. II. The yellow and green excitonic series. Yu, P.Y.; Shen, Y.R. (IBM Thomas J. Watson Research Center, Yorktown Heights, New York 10598). *Phys. Rev., B;* **17**: No. 10, 4017-4030(15 May 1978).

Resonant Raman scattering of multiphonon modes have been studied in Cu_2O in the region of its yellow and green excitonic series. Resonant enhancements of a large number of Raman modes have been observed. The experimental results have been interpreted quantitatively in terms of three kinds of exciton-phonon scattering processes: (i) intro-yellow-exciton scattering: depending on the energy of the yellow exciton, the phonons involved are the infrared active Γ^-_15 (660 cm^-1) or the Γ^-_12 (109 cm^-1) and Γ^-_15 (154 cm^-1) modes; (ii) interexciton scattering between the 2P green exciton state

and yellow exciton continuum: the phonon responsible for this scattering process is the high-energy Γ^-_{15} mode; and (iii) intra-green-exciton scattering: only the low-energy Γ^-_{15} mode is involved. From these results a detailed picture of the relaxation mechanisms of the yellow and green excitons in Cu_2O by emission of phonons is obtained.

45093 Mobilities and longitudinal diffusion coefficients for Cs^+ ions in He and Ne gas. Pope, W.M.; Ellis, H.W.; Eisele, F.L.; Thackston, M.G.; McDaniel, E.W.; Langley, R.A. (School of Physics, Georgia Institute of Technology, Atlanta, Georgia 30332). *J. Chem. Phys.;* **68**: No. 10, 4761-4762(15 May 1978).

Ion mobilities and longitudinal diffusion coefficients of Cs^+ are measured in He and Ne gas using the drift tube mass spectrometer.(AIP)

45094 Ionic motion in α-AgI. Vashishta, P.; Rahman, A. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev. Lett.;* **40**: No. 20, 1337-1340(15 May 1978).

A molecular-dynamics study of silver diffusion in superionic conductor α-AgI is performed. Interionic potentials are constructed using Pauling's ideas of ionic radii. The diffusion constant for silver and its temperature dependence are in good agreement with experiment. Good agreement is also obtained for the silver density map with the experiment of Cava, Reidinger, and Wuensch.

45095 Effect of morphology on helium mobility in soda-lime-silica glasses. Shelby, J.E. (Sandia Laboratories, Livermore, California 94550). *J. Appl. Phys.;* **49**: No. 5, 2748-2751(May 1978).

Helium permeability has been measured for a wide range of soda-lime-silica glasses. The results have been used to define the interconnectivity and miscibility limits for this glass-forming system. Results of heat-treatment studies have also been used to determine the interconnectivity boundary temperature for the $2Na_2OxCaOxXSiO_2$ compositional line. It has also been shown that the replacement of Na_2O by CaO substantially reduces the mobility of helium in those glasses lying outside the immiscible region.

45096 Low-temperature specific heat, thermal conductivity, and ultrasonic velocity of glassy carbons. Katerberg, J.A.; Anderson, A.C. (Materials Research Laboratory and Department of Physics, University of Illinois at Urbana: Champaign, Urbana, Illinois). *J. Low Temp. Phys.;* **30**: No. 5, 739-745(1 Mar 1978).

We have measured the specific heat ($0.1<T<1K$) and thermal conductivity ($0.07<T<300K$) of two glassy carbons, one pyrolysed at 1000°C, the other at 2500°C. The temperature dependence of ultrasonic velocity (0.2—300K) was also measured on the 2500°C material. The above properties are remarkably similar to those of amorphous materials, yet it appears that these features arise from origins other than the localized excitations responsible for the low-temperature behavior of amorphous materials.

45097 Conduction-electron spin resonance in Hg/sub 1-x/Cd/sub x/Te solid solutions. Bratashevskii, Y.A.; Tyutyunnik, V.B.; Aver'yanov, K.S.; Nesmelova, I.M. (Technical Physics Institute, Academy of Sciences of the Ukrainian SSR, Donetsk). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 9, 586(Sep 1977).

Conduction-electron spin resonance in Hg/sub 1-x/Cd/sub x/Te has been examined at 4.2°K and 76x10⁹ Hz for a sample with an electron concentration of about 10^15 cm^-3. The free-electron g factors derived from the spin resonance are in satisfactory agreement with values calculated from Kane's model.

45098 Characteristics of the contribution of Dy^3+ and Tb^3+ ions to the anisotropy of Dy/sub x/Tb/sub 1-x/FeO_3 orthoferrites. Derkachenko, V.N.; Kadomtseva, A.M.; Kovtun, N.M.; Timofeyeva, V.A.; Khokhlov, V.A.; Kazakevich, O.V. (Physicotechnical Institute, Academy of Sciences of the Ukrainian SSR, Donetsk). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 7, 435-436(Jul 1977).

The magnetic properties of Dy/sub x/Tb/sub 1-x/FeO_3 (x=0.75, 0.5, 0.25, 0) single crystals were studied. On the basis of the data obtained in this study, the maximum value of the anisotropy factor K/sup a/b/sub Fe/ in the crystallographic ab-plane of the iron sublattice is now calculated and it is shown that K/sup a/b/sub Tb/ is much larger than K/sup a/b/sub Dy/, while K/sup a/c/sub Tb/ is small.

45099 (UCRL-Trans—11353) **Apparatus for the infrared spectroscopic study of solids at high pressures (12 kbars) and low temperatures (4.2°K and 2°K).** Jean-Louis, M.; Vu, H. Translated from *Rev. Phys. Appl.;* **7**: No. 2, 89-94(1972). 15p. Dep. NTIS, MF A01.

Portions of document are illegible.

An apparatus including a liquid helium cryostat, an eight ton press and a high pressure cell for 12 kbars and 2°K is described. Pressure measurements are made at 4.2°K by the displacement of the absorption edge of a GaSb sample imbedded in solid hydrogen. Some results on the fundamental vibration-rotation spectrum of pure solid hydrogen under pressure are given.

CORROSION, EROSION, AND DEGRADATION

REFER ALSO TO CITATION(S) 44810

RADIATION EFFECTS

45100 Role of stresses in annealing of ion-implantation damage in Si. Seshan, K.; EerNisse, E.P. (Department of Materials Science and Engineering, University of California, Berkeley, California 94720). *Appl. Phys. Lett.;* **33**: No. 1, 21-23(1 Jul 1978).

Recent results showing a crystallographic orientation dependence of growth kinetics, secondary defects, and stress relief in annealing of ion-implanted Si are shown to be self-consistent if interpreted in terms of the influence of stresses upon annealing processes. The stress influence proposed is microplastic shear which is induced in [112] directions on (111) planes inclined to the implant surface by the biaxial stress created in the implant region by ion-implantation damage. The shear stresses are shown to be dependent on crystallographic orientation in a manner consistent with the model.

45101 Zero-bias resistance of grain boundaries in neutron-transmutation-doped polycrystalline silicon. Seager, C.H.; Castner, T.G. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 7, 3879-3889(Jul 1978).

We have characterized the electrical transport properties of neutron-transmutation-doped polycrystalline silicon. Zero-bias measurements of resistance have been made as a function of temperature on both bulk specimens and individual grain boundaries in this material. Below a doping level of $\sim 2 \times 10^15$ phosphorus/cm^3, the bulk resistance has a nearly Arrhenius behavior with an activation energy of ~0.55 eV; above this donor concentration the resistivity is markedly curved on an Arrhenius plot with values of slope which decrease with decreasing temperature. Potential probe measurements show that a large spread in grain-boundary impedances exist in these higher-doped specimens. We compare our data to theoretical expressions for current flow across grain-boundary potential barriers and good agreement is observed; these comparisons indicate that the largest grain-boundary state densities observed in our samples consist of $\sim 6 \times 10^11$ available single-electron-states/cm^2 located within ~0.2 eV from the center of the forbidden gap. The chemical potential of these grain-boundary regions is found to lie at midgap, in agreement with previous data on thin-film polycrystalline silicon. We note that the considerably higher orientation-independent state densities found in thin-film polycrystalline silicon contrasts strongly with the present data and suggest the presence of serious contamination effects in previously studied material.

45102 Comparative study of laser and thermal annealing of boron-implanted silicon. Narayan, J.; Young, R.T.; White, C.W. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Appl. Phys.;* **49**: No. 7, 3912-3917(Jul 1978).

Transmission electron microscopy has been used to study the effects of high-power laser pulses on as-grown and boron-implanted silicon. No defects (dislocations, dislocation loops, and stacking faults) were observed in either as-grown or boron-implanted (doses 3×10^15 and 2×10^16 ions cm^-2) silicon after pulsed laser treatment. In thermally annealed specimens, on the other hand, a significant amount of damage was retained even after annealing at 1100 °C for 30 min. After thermally annealing the implanted laser-treated specimens at 600 and 900 °C for 30 min, no defects were observed for low-dose specimens; however, in high-dose specimens, precipitation of boron occurred after 600 °C annealing and it increased after annealing at 900 °C. These results and the electrical measurements on these samples suggest that the boron atoms in the precipitates are electrically inactive.

45103 Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes. Dietz, R.E.; Campagna, M.; Chazalviel, J.N.; Shanks, H.R. (Bell Laboratories, Murray Hill, New Jersey 07974). *Phys. Rev., B;* **17**: No. 10, 3790-3800(15 May 1978).

Energy-loss spectra were measured by backscattering 500-eV electrons from films of WO_3 grown on single-crystal W(100), and from single crystals of Na/sub x/WO_3 ($0.35 < x < 0.86$) and ReO_3 which were cleaved in ultrahigh vacuum. The spectrum of a crystal with $x = 0.61$ was nearly identical to the surface loss function $Im[-(\epsilon + 1)^-1]$ calculated from ϵ measured by optical reflectivity on a crystal with $x = 0.65$. For $x = 0.61$, two plasmons are observed, ω/sub -/ = 1.90 eV, and ω/sub +/ = 6.5 eV. ω/sub -/ scales approximately as x/sup 1/2/ and is assigned to the conduction-electron resonance. The plasmon lifetime tau/sub p/ = 1.9×10^-15 sec determined from the observed linewidth agrees well with a value for the conduction-electron relaxation time tau/sub e/ = 2.1×10^-15 sec we obtained from previously reported reflectivity data, but is shorter than a value tau/sub c/ = 6.7×10^-15 sec we estimated from previously reported dc conductivity data. The higher-energy plasmon ω/sub +/ is assigned to a screened longitudi-

nal resonance of an interband excitation near 5 eV. ω/sub +/ is essentially independent of x for 0 < or = x < 0.9. By fitting ϵ between 0 and 10 eV with a model dielectric function, we found a value for the mean effective conduction electron mass m* = 0.80m/sub e/, the interband contribution to the static dielectric constant ϵ/sub s/ = 4.35, and values for parameters characterizing the interband resonance. Taking these latter parameters to be independent of x, we calculated the bulk and surface loss functions for different x values. These calculations indicate that mode hybridization is unimportant for x < 1 in the bronzes. The effects of damping or joint density-of-states width, screening, and mode interference on the plasmon spectra are discussed. It is shown that ReO_3 and Ag metal have dielectric and energy-loss functions which are similar to the tungsten bronzes.

45104 Volume expansion and annealing compaction of ion-bombarded single-crystal and polycrystalline α-Al_2O_3. Krefft, G.B.; Eer-Nisse, E.P. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 5, 2725-2730(May 1978).

Radiation damage of α-Al_2O_3 was systematically investigated as a function of incident ion mass and energy partitioning into atomic and electronic processes by measuring the resulting stress in the ion-bombarded layer with a cantilever beam technique. Heavy-ion-bombardment-induced expansion in the implanted surface layer shows strong anisotropy which appears to be related to the higher defect production rate along the c axis. Stress relief is observed at fluences above 1 x 10^{15} Ar/cm^2 for the [0001] orientation only and is attributed to basal slip. Hydrogen bombardment subsequent to heavy-ion bombardment results in compaction which is also anisotropic. The anisotropy of both the expansion and the compaction point to structure sensitive defects. Approximately 80% of the radiation damage is annealed at 900 °C for the [0001] orientation and 60% for the [0110] orientation. A similar expansion-compaction response is found in argon- and hydrogen-bombarded polycrystalline Al_2O_3.

45105 Electron spin resonance in CdS:Mn single crystals irradiated with ^{60}Co γ rays. Galushka, A.P.; Shul'ga, S.Z. (Institute of Nuclear Research, Academy of Sciences of the Ukrainian SSR, Kiev). *Sov. Phys. - Semicond. (Engl. Transl.);* **11**: No. 2, 218-219(Feb 1978).

Bombardment of CdS:Mn single crystal with γ rays produced paramagnetic centers with features differing from those observed earlier. The newly discovered defects were interstitial sulfur atoms migrating (with increasing temperature) along the lattice and becoming ionized in the presence of manganese ions.

CHEMISTRY

ANALYTICAL AND SEPARATIONS CHEMISTRY

REFER ALSO TO CITATION(S) 45303, 45819

45106 Recruitment of benthic animals as a function of petroleum hydrocarbon concentrations in the sediment. Anderson, J.W. (Marine Research Lab., Sequim, WA); Riley, R.G.; Bean, R.M. *J. Fish. Res. Board Can.;* **35**: No. 5, 776-790(May 1978).

Three separate field installations, consisting of clean and oiled sediment in fiberglass trays, were placed in the intertidal zone of Sequim Bay, Washington, to determine rates of hydrocarbon depuration and recruitment of benthic organisms. Detailed chemical analysis, with glass capillary gas chromatography and gas chromatography-mass spectroscopy, were conducted such that individual compounds and hydrocarbon classes associated with the sediment after varying periods of field depuration could be quantitated. Depuration rates of hydrocarbon types in sediment receiving oil on the surface (installations I and II) decreased in the order of saturates, methylnaphthalenes, and methylphenanthrenes. Rates of specific compound and hydrocarbon class depuration followed the general pattern exhibited by total hydrocarbons (infrared analyses). In a period of 100 d, total hydrocarbons in surface-oiled, coarse sediments (I and II) decreased by 82-88%, while the amount in the finer substrate with mixed in oil (III) only decreased by about 21% and remained quite stable up to 290 d. The ratios of nC_{17}/pristane and nC_{18}/phytane were monitored for installations I and III (oil mixed with sediment). The ratios remained constant for a period of 4-6 mo and then dropped sharply, suggesting the presence of oil biodegradation. These results are discussed in relation to physical and chemical processes acting on the oil-contaminated sediments. Initial concentrations of oil in sediments upon field emplacement were about 5000-6000 ppM in installations I and II and approximately 700 ppM in installation III. At these concentrations, no substantial inhibition of recruitment by benthic organisms was observed. These results are discussed in light of oil spill studies and other field experiments.

45107 Review of the status of total mercury analysis. Burrows, W.D. (Associated Water and Air Resources Engineers, Inc., Nashville). pp 51-61 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The following methods for analysis of total mercury are reviewed: flameless or cold vapor atomic absorption spectrometry; flameless emission spectrometry; atomic fluorescence spectrophotometry; digestion--reduction-aeration system for liquids; combustion furnace for solids; neutron activation analysis; colorimetric and photometric methods; kinetic methods; photometric and amperometric titrations of mercury with seguestering agents such as EDTA; fluorimetric determination of mercury; the gravimetric method; gas chromatography; and x-ray fluorescence. (HLW)

ACTIVATION AND NUCLEAR REACTION PROCEDURES

REFER ALSO TO CITATION(S) 44221, 44234, 44235

45108 (HMI-B—188) **Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications.** Braetter, P.; Gatschke, W.; Gawlik, D.; Moeller, J.; Wenckel, W. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Kernchemie und Reaktor). 1977. 114p. (In German). Dep. NTIS (US Sales Only), PC A06/MF A01.

The study reports in detail about the on-line activation analysis facility installed in the BER-II reactor of the Hahn-Meitner Institute, which is to be used especially to determine very shortlived isotopes (of the order of microseconds and seconds). Pneumatic transport systems with the high transport velocities required result in a number of specific problems, the solution of which is outlined. Studies have been carried out in closed tube systems of the attenuation, the propagation velocity and reflection of shock waves occurring at the high flow velocities required. A test rig was designed to examine the movement of the transport capsule in the shock waves, its slowdown by adiabatic compression, and the incidents which can occur in practical operation. Another problem is the necessary measurement, to a precision of 1 msec, of the in-pile and holdup times. Counting losses due to deadtime and pulse pile-up in gamma spectrometric measurement and ways of correcting them are also outlined. Finally, some examples are given of the non-destructive analysis of biological materials: quantitative assays of selenium through the Se-77m isotope in the NBS bovine liver standard and in dried blood serum, and fluorine assays in the bone matrix via shortlived F-20.

CHEMICAL PROCEDURES

45109 (UCRL—13826) **Development of control algorithms for chemistry systems. Final report, September 1, 1978—September 30, 1977.** Burbaker, T.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 1 Feb 1978. Contract W-7405-ENG-48. 73p. Dep. NTIS, PC A04/MF A01.

The following work was done: (1) Development of the mathematics for the estimation of the ISE time constant. (2) Development of the inverse filter and a correction algorithm to improve the estimate of the equivalence point for potentiometric titration using ion selective electrodes. (3) The initial formulation of the enzyme system control algorithms. (4) The development of the analytical expression for a point replacement algorithm to remove bad data points on the enzyme response surfaces. (5) The matching of kinetic models for an enzyme reaction to experimental reaction rate surfaces. (6) Continued development of interactive design software.

45110 (UCRL—80878) **Titrimetry is alive and well at LLL.** Selig, W. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 17 Apr 1978. Contract W-7405-ENG-48. 15p. Dep. NTIS, PC A02/MF A01.

The analysis of organic composites and the assay of organic materials continue to be important at the Lawrence Livermore Laboratory (LLL). Recent trends have been toward small samples analyzed by complex instruments and methods. In this paper a variety of titrimetric methods recently developed at LLL are presented. The following topics are discussed: An automated titration system controlled by a Tektronix 4051 graphics system; a new titrant for large inorganic and organic anions including several of ordnance interest (e.g., perchlorate, nitroform, picrate); a new nonaqueous titrimetric method for nitroguanidine that avoids interference from HMX and RDX; a nonaqueous titrimetric method for PETN; and a reductometric micromethod for PETN in the presence of silicone rubber.

RADIOMETRIC AND RADIOCHEMICAL PROCEDURES

REFER ALSO TO CITATION(S) 44081, 44227, 44231, 45268

45111 (DPSPU—77-30-10) **Computerized radionuclidic analysis in production facilities.** Gibbs, A. (Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Plant). Mar 1978. Contract EY-76-C-09-0001. 10p. Dep. NTIS, PC A02/MF A01.

The Savannah River Plant Laboratories Department has been using a dual computer system to control all radionuclidic pulse height analyses since 1971. This computerized system analyzes 7000 to 8000 samples per month and has allowed the counting room staff to be reduced from three persons to one person. More reliable process information is being returned to the production facilities and for environmental evaluations and being returned faster, even though the sample load has more than tripled. This information is now more easily retrievable for other evaluations. The computer is also used for mass spectrometer data reduction and for quality control data analysis. The basic system is being expanded by interfacing microcomputers which provide data input from all of the laboratory modules for quality assurance programs.

SPECTRAL PROCEDURES

REFER ALSO TO CITATION(S) 44225, 44262

45112 (IS—4353) **Specifications for an inductively coupled plasma simultaneous multielement analysis system.** Haas, J.W. Jr.; Winge, R.K.; Kniseley, R.N.; Fassel, V.A. (Ames Lab., Iowa (USA)). Feb 1978. Contract W-7405-ENG-82. 33p. Dep. NTIS, PC A03/MF A01.

Specifications are presented for those items of hardware, software, and overall system performance which are of known importance in atomic emission spectroscopy--simultaneous multielement analyses (ICP-SMA) instrument systems. Particular attention is directed to the specified data reporting and quality assurance features which are required for improving the validity and interpretability of the analytical results, and the specified background correction procedures which are necessary for accurate quantitative determinations near the limit of detection. The specification package was prepared to specify and purchase an ICP-SMA system which will provide maximum value and utility for the simultaneous determination of major, minor and trace quantities of the elements in a wide variety of sample materials. Modifications of the analytical line array specified here may be appropriate for other, more specific, analytical tasks. Budgetary realities may necessitate additional, appropriate modifications. It is anticipated, however, that the specification package presented here will have general utility as a guide in the preparation of ICP-SMA procurement packages for other laboratories and other analytical applications.

45113 **Synchrotron radiation research: Recent developments.** Lindau, I.; Winick, H. (Stanford Synchrotron Radiation Project, Stanford University, Stanford, California 94305). *J. Vac. Sci. Technol.;* **15**: No. 3, 977-983(May 1978).

Synchrotron radiation as a new tool within photon beam technology was described in the 13th Symposium on Electron, Ion, and Photon Beam Technology in Colorado Spings in May 1975. In this paper, we give a review of the developments since that time of the use of synchrotron radiation at SSRP (Stanford Synchrotron Radiation Project). The unique properties of synchrotron radiation have during the last two years been applied to an ever increasing number of research problems within x-ray absorption, diffraction, fluorescence, and scattering, within surface science, atomic, and molecular spectroscopy. The research capabilities at SSRP have been expanded and new instrumentation with, for instance, focusing x-ray optics has been developed. In particular, we want to discuss the current prospects and plans for expansion of the research facilities at SSRP.

45114 **Auger electron spectroscopy studies of I—III—VI_2 chalcopyrite compounds.** Kazmerski, L.L.; Sprague, D.L.; Cooper, R.B. (Photovoltaics Branch, Solar Energy Research Institute, Golden, Colorado 80401). *J. Vac. Sci. Technol.;* **15**: No. 2, 249-253(Mar 1978).

Auger electron spectroscopy (AES) spectra are presented for Cu ternary chalcopyrite compounds. $CuInS_2$, $CuInSe_2$, and $CuInTe_2$ thin films, bulk polycrystalline, and single-crystal samples are examined and their AES spectra are compared. The validity of quantitative analysis methods [(1) calibration with Ag-standard, (2) utilization of sensitivity factors, and (3) calibration with specific ternary standards] is examined and the results are compared. Consistent results are obtained for polycrystalline (bulk and thin film) samples, but not for the single-crystal cases. It is found that peak width variations must be considered in the single-crystal data which vary due to diffraction channeling effects. Calculations, taking these variations into account, yield the expected results.

SEPARATION PROCEDURES

REFER ALSO TO CITATION(S) 45351

45115 (DP—1495) **Recovery of plutonium from carbon analysis residues.** Gray, L.W.; McGahee, N.W. (Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.). Apr 1978. Contract EY-76-C-09-0001. 14p. Dep. NTIS, PC A02/MF A01.

A method was developed for the recovery of plutonium from residues resulting from analyses of plutonium metal for carbon. The residue from each carbon analysis contains about 0.5 g of plutonium as high-fired PuO_2. By use of 2/sup P/ factorial experimental designs, recovery methods utilizing a variety of acids and conditions were investigated. The optimum recovery procedure was determined to be leaching of the crushed crucible and contents with a hot solution of 7M HNO_3 - 0.2M HF for about four hours. Dissolution of the crucible matrix is kept to a minimum by holding the leach solution to crucible residue ratio to about 2.5 mL/g of solids. Increasing this ratio to $>$ or $=$ 10 does not improve the recovery of plutonium. 7 tables, 2 figs.

45116 **Removal of gas chromatographable organic compounds from water by a spray vaporization technique.** Chriswell, C.D. (Iowa State Univ., Ames). *J. Chromatogr.;* **132**: 537-542(1977).

A variation of inert gas stripping, called spray vaporization, has been developed which is simple, produces 600 ml/h of water, and leads to a significant reduction in the concentration of most gas chromatographable organic compounds. Water is atomized into a high-velocity gas stream using a common nebulizer; the fine water mist produced is impacted on a glass surface, where it condenses and drains into a reservoir.

45117 (UCRL-Trans—11365) **Selective separation of technetium.** Zuber, G.; Lieser, K.H. Translated from *Radiochim. Acta;* **21**: No. 1-2, 60-62(1974). 10p. Dep. NTIS, PC A02/MF A01.

Technetium can be separated on sparingly soluble sulfides from fission product solutions. The most efficient was cadmium sulfide. In separation columns from nitric acid solutions about 99 percent of the technetium was obtained containing small amounts of other fission products. Extraction with tetraphenylarsonium chloride in chloroform was used for purification.

INORGANIC AND PHYSICAL CHEMISTRY

CHEMICAL AND PHYSICOCHEMICAL PROPERTIES

45118 (COO—1198-1212) **Raman studies of hydrogen vibrational modes in palladium.** Sherman, R. (Illinois Univ., Urbana (USA)). 1978. Contract EY-76-C-02-1198. 76p. Dep. NTIS, PC A05/MF A01.

Thesis.

The phonon density of states of substoichiometric polycrystalline Pd-H(D) was investigated by Raman scattering above and below the 50 K anomaly. The Raman spectra for hydrogen and deuterium were found to be asymmetric and peaked at 58.5 MeV and 39.7 MeV, respectively, in near agreement with inelastic neutron scattering data. The scattering mechanism appears to require hydrogen-hydrogen interactions. No major changes in the optical spectra were observed in going through the 50 K anomaly.

45119 **Proceedings of the sixth international congress on catalysis.** Bond, G.C.; Wells, P.B.; Tompkins, F.C. (eds.). London; Chemical Society (1977). vp. (CONF-760769—).

From 6. congress on catalysis; Imperial College, UK (12 Jul 1976).

Separate abstracts were prepared for individual papers. (JR)

45120 (ORNL-tr—4627) **Self diffusion of calcium ions in soda lime and slag glasses.** Terai, R.; Okawa, E. Translated by H. Kubota from *Yogyo Kyokai Shi;* **85**: No. 6, 295-299(1977). 7p. Dep. NTIS, PC A02/MF A01.

The self-diffusion coefficients of calcium ions in 16 Na_2O . 12 CaO . 72 SiO_2(wt %) glass and 40 CaO . 20 Al_2O_3 . 40 SiO_2(wt %) slag glass at temperatures near and below transition point have been measured employing radioisotope ^{45}Ca. The concentration gradient of radioactivity in surface layer of glass samples after diffusion annealing was determined by counting the residual activity with a GM-tube counter on the surface by progressively chemical etching away the material in steps of about 1 micron meter. It was found that the self-diffusion coefficients of calcium ions in both glasses below the transition point were of the order of 10^{-14} to 10^{-16} cm^2/s, suggesting that the mobility of calcium ions was extremely small in the solid glasses. The activation energy for diffusion of calcium ions in solid glasses was about 60 kcal/mol, which seemed to be reasonable in comparison with the electrostatic binding energy between cation and oxygen ion. The self-diffusion coefficients of calcium ions

in the slag glass agrees closely with those of oxygen ions below the transition point, while the self-diffusion coefficients of calcium ions in the soda-lime glass are greater by one order of magnitude than those of oxygen ions in the same glass. The difference of diffusion behavior of calcium ions in the slag and the soda-lime glasses may be attributed to action of alkali ions on the mobility of calcium ions.

45121 (UCRL-Trans—11350) **Section I. Tension analysis of the system nickel monosulfide/nickel disulfide/sulfur.** Voigt, A.; Meisel, K. Translated from *Z. Anorg. Allg. Chem.;* **228**: 278-279(1936). 3p. Dep. NTIS, PC A02/MF A01.

Preparation of NiS and NiS_2 is reported. When in powdered form, they react with air to form SO_2. (DLC)

ISOTOPE EXCHANGE AND ISOTOPE SEPARATION

REFER ALSO TO CITATION(S) 44033

45122 (BNL—50755) **Hydrogen isotope exchange in metal hydride columns.** Wiswall, R.; Reilly, J.; Bloch, F.; Wirsing, E. (Brookhaven National Lab., Upton, N.Y. (USA)). 21 Nov 1977. Contract EY-76-C-02-0016. 34p. Dep. NTIS, PC A03/MF A01.

Several metal hydrides were shown to act as chromatographic media for hydrogen isotopes. The procedure was to equilibrate a column of hydride with flowing hydrogen, inject a small quantity of tritium tracer, and observe its elution behavior. Characteristic retention times were found. From these and the extent of widening of the tritium band, the heights equivalent to a theoretical plate could be calculated. Values of around 1 cm were obtained. The following are the metals whose hydrides were studied, together with the temperature ranges in which chromatographic behavior was observed: vanadium, 0 to 70°C; zirconium, 500 to 600°C; $LaNi_5$, -78 to +30°C; Mg_2Ni, 300 to 375°C; palladium, 0 to 70°C. A dual-temperature isotope separation process based on hydride chromatography was demonstrated. In this, a column was caused to cycle between two temperatures while being supplied with a constant stream of tritium-traced hydrogen. Each half-cycle was continued until "breakthrough," i.e., until the tritium concentration in the effluent was the same as that in the feed. Up to that point, the effluent was enriched or depleted in tritium, by up to 20%.

CHEMICAL AND PHYSICOCHEMICAL PROPERTIES

REFER ALSO TO CITATION(S) 45126

ELECTROCHEMISTRY

REFER ALSO TO CITATION(S) 44849

PHOTOCHEMISTRY

REFER ALSO TO CITATION(S) 45169

45123 **Measurement of fluorescence polarization at high pressure.** Chryssomallis, G.S.; Drickamer, H.G.; Weber, G. (School of Chemical Sciences, Materials Research Laboratory, and Department of Biochemistry, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801). *J. Appl. Phys.;* **49**: No. 6, 3084-3087(Jun 1978).

High pressure was used to change the viscosity isothermally for the measurement of polarization of fluorescence of small fluorescent molecules in solution. A new technique, necessary for the measurements, as well as a new instrument to perform them, are described and discussed. Although the apparatus is not well suited for determining absolute polarization values, it is quite accurate in detecting changes in polarization due to change in pressure. Independent readings of polarization at 1 atm were therefore obtained using a different instrument. For the sample system, quinine sulfate in isobutanol, there is good agreement between the data obtained by pressure variation and those obtained by temperature variation. The extension of the method to study polymers and proteins in solution and its advantages over previous methods are also discussed.

45124 **Direct detection of the biradicals generated in the Norrish type II reaction.** Small, R.D. Jr.; Scaiano, J.C. (Univ. of Notre Dame, IN). *Chem. Phys. Lett.;* **50**: No. 3, 431-434(15 Sep 1977).

The biradicals generated in the Norrish type II reaction from the triplet manifold have been observed using laser flash photolysis techniques. The spectra and extinction coefficients closely resemble those of typical ketyl radicals. Typical lifetimes are in the 40 to 100 ns range depending on the solvent. Their interaction with oxygen is essentially diffusion controlled.

RADIATION CHEMISTRY

45125 **Radiation chemistry of polyethylene. XIV. Allyl radical decay kinetics in different types of polyethylene.** Patel, V.M.; Patel, G.N.; Gvozdic, N.; Hsu, C.S.; Dole, M. (Baylor Univ., Waco, TX). *J. Polym. Sci., Polym. Phys. Ed.;* **16**: No. 3, 467-484(Mar 1978).

The decay kinetics of the chain allyl free radical has been studied in the following morphological forms of polyethylene (PE): Marlex bulk film, hydrogenated PE, and extended-chain PE. Coupled with previous work on single-crystalline PE it can be seen that the decay rate is greater the more amorphous the sample. In the Marlex bulk film and hydrogenated PE the decay can be interpreted in terms of a simultaneous fast and slow decay process by means of our Q-function equation, but with rising temperature the decay approximates a single rate process. With extended-chain PE the allyl decay rate does not become appreciable until the melting range is approached. The fraction of allyl radicals decaying by the slow process is 2 to 10 times greater than the fraction of fast decaying radicals. The ratio of the fast decay rate constant to that of the slow rate constant is greater for the bulk Marlex film than for the hydrogenated PE. All ratios decrease with rising temperature. For times up to about 150 min the allyl decay in the extended-chain PE accurately follows a single second-order decay law with a time-independent diffusion controlled reaction rate constant.

45126 (NTIS/PS—78/0050) **The chemistry of silicone resins (a bibliography with abstracts). Report for 1964—January 1978.** Cavagnaro, D.M. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 216p.

The synthesis, polymerization, and chemical reactions of silicone and silicon-containing polymers and copolymers are covered. References include citations on grafting and crosslinking reactions, radiation polymerization, and spectra and molecular structure as they relate to properties. (This updated bibliography contains 211 abstracts, 30 of which are new entries to the previous edition.)

45127 (ORO—2845-T1) **Radiation-induced crosslinking of polyethylene in the presence of bifunctional vinyl monomers.** Joshi, M.S. (Maryland Univ., College Park (USA). Dept. of Chemical Engineering). 6 Oct 1976. Contract EY-76-S-05-2845. 95p. Dep. NTIS, PC A05/MF A01.

Thesis.

The apparent crosslinking produced by the radiation grafting of two monomers to polyethylene, acrylic acid and acrylonitrile, was investigated. Evidence is presented to show that covalent crosslinks are not produced during the radiation grafting step; covalent crosslinks are produced by the post-irradiation heat treatment associated with measurements of gel; the enhancement in gel fraction and physical properties arises from true crosslinks rather than chain entanglements; and there may be practical value associated with the sensitization of crosslinking produced by the methods employed in this work. The effect of monomer-solvent composition on the graft and gel yield was studied. Viscoelastic properties of grafted films were determined above the melting point of pure polyethylene. The kinetic data, infrared spectra, and viscoelastic properties are the bases for the following mechanism: (1) Acrylic acid-g-PE: Acrylic acid enters the film in the form of a hydrogen bonded dimer and undergoes a grafting reaction that produces hydrogen-bond crosslinks. The heat treatment during the conventional methods for determining of crosslinks convert them into intermolecular anhydride bonds. (2) Acrylonitrile-g-PE: In this, the post-grafting crosslinking is the result of a thermally induced chain reaction leading to an uninterrupted conjugated sequence. The length of the ring structure increases with time and temperature, and the intensity of color increases with the length of the ring structure.

RADIOCHEMISTRY AND NUCLEAR CHEMISTRY

PROPERTIES OF RADIOACTIVE MATERIALS

REFER ALSO TO CITATION(S) 44240, 45391

45128 (JEN—393) **Alpha spectrometry of thick sources. II. Application to the study of radioactive equilibria in uranium ores.** Acena Barrenechea, M.L.; Tormo Ferrero, M.J. (Junta de Energia Nuclear, Madrid (Spain)). 1977. 32p. (In Spanish). Dep. NTIS (US Sales Only), PC A03/MF A01.

A method for determining nuclide activities in 4n + 2 uranium series using alpha spectrometry of thick sources is described. This method has been applied to several uranium ores, showing different states of radioactive equilibria. The spectra from samples prepared by cold compression show some anomalies, due to the evolution and later decay of ^{219}Rn and daughters. This phenomenon

must be taken in consideration when computing spectra line intensities.

COMBUSTION CHEMISTRY

45129 (LBL—6898) **Inhibition effects on extinction of polymer burning.** Pitz, W.J.; Sawyer, R.F. (California Univ., Berkeley (USA). Dept. of Mechanical Engineering). Apr 1978. Contract W-7405-ENG-48. 21p. (CONF-780417—6). Dep. NTIS, PC A02/MF A01.

From Western States Section/Combustion Institute; Boulder, CO, USA (17 Apr 1978).

The opposed flow diffusion flame has proven a useful laboratory tool for the study of the combustion of both liquids and solids. Quantitative determinations of burning rates, extinction limits, mass transfer numbers, solid fuel thermal diffusivities, and flame structures have been obtained under well-controlled and reproducible conditions, Holve and Sawyer (1975), T'ien, et al. (1976). Extinction limits are of particular interest, especially in assessing inhibitor addition. Extinction data reveal the effect of inhibitors on the chemical reaction rate. In this study inhibitors have been added to both the gaseous oxidizer and the solid fuel. Extinction data have been obtained for polyethylene (PE) and poly(vinyl chloride) (PVC) in N_2/O_2 mixtures. These data are compared to extinction measurements of polyethylene with an N_2/O_2/HCl mixture. Poly(vinyl chloride) differs chemically from polyethylene only by a substitution of a chlorine atom for a hydrogen atom in the monomer. With the inclusion of this halogen atom, poly(vinyl chloride) may be thought of as an "inhibited" polyethylene and therefore well suited for a comparative study. The behavior of the HCl added to the oxidizer side of the diffusion flame was found to be primarily that of an inert, in comparison to Cl being added to the fuel side of PVC. Impurities in this commercial PVC and PE may have had an effect on the extinction data.

45130 (SAND—77-8275) **Numerical modeling of unsteady flame propagation.** Dwyer, H.A.; Sanders, B.R. (California Univ., Davis (USA); Sandia Labs., Albuquerque, N.Mex. (USA)). Feb 1978. Contract EY-76-C-04-0789. 31p. Dep. NTIS, PC A03/MF A01.

The problem of the numerical modeling of unsteady flame propagation with large amounts of exothermic heat release was addressed through the use of a model equation which contains many of the important nonlinearities and difficulties in the problem. The model equation was solved for a significant variation in Damkoehler number with a variety of conventional and new finite-difference procedures. One of the new procedures used was an adaptive grid method which places node points in the region of large temperature gradients where they are necessary for a proper simulation of the phenomena. This adaptive grid procedure does have significant advantages over conventional second- and fourth-order uniform grid methods for many aspects of the problem. It was found that conventional methods with relatively few node points are inadequate for flames with high Damkoehler number, because of the fact that too few nodes are located in the flame. Further refinement of the adaptive grid method seems feasible, but even in the present form it represents a significant improvement over conventional techniques. 5 figures, 1 table.

45131 **Source of ignition 'hot surfaces'.** Vogt, G. *Glueckauf;* **113**: No. 21, 1000-1005(Nov 1977). (In German).

Igniting current and igniting temperatures in wires of various thickness and of various material in mixtures of methane and air and in mixtures of hydrogen and air are described.

ENGINEERING

45132 (UCRL—50016-78-1) **Mechanical Engineering Department quarterly report, January—March 1978.** Stone, R.G.; Bathgate, M.B. (eds.). (California Univ., Livermore (USA). Lawrence Livermore Lab.). 31 Mar 1978. Contract W-7405-ENG-48. 29p. Dep. NTIS, PC A03/MF A01.

Separate abstracts have been prepared for each section of the report. (TFD)

GENERAL ENGINEERING

45133 (TID—28375) **Educational programs and facilities in nuclear science and engineering.** (Oak Ridge Associated Universities, Inc., Tenn. (USA). University Programs Office). Feb 1975. Contract EY-76-C-05-0033. 81p. Dep. NTIS, PC A05/MF A01.

The programs and facilities of U.S. schools which offer education in nuclear science and engineering, and nuclear or nuclear-related technologies are summarized. A general requirement for inclusion in the listing of four-year institutions was that a school must offer at least four courses in nuclear or nuclear-related topics including quantum mechanics. However, schools which did not fully meet that course requirement were included if they specified the availability of a nuclear option in consort with other institutions.

FACILITIES AND EQUIPMENT

REFER ALSO TO CITATION(S) 45284

45134 (RFP—2722) **Evaluation of plasma arc welding capabilities and applications.** Mills, G.S. (Atomics International Div., Golden, Colo. (USA). Rocky Flats Plant). 31 May 1978. Contract EY-76-C-4-3533. 14p. Dep. NTIS, PC A02/MF A01.

Unique capabilities of plasma arc welding in the keyhole mode are described, and the potential applicability of these capabilities to Rocky Flats production needs are evaluated. For the areas of potential benefits studied, the benefits of this welding technique either did not materialize or the complication of implementing the process in production was not warranted by the demonstrated benefits.

45135 (UCRL—50016-78-1, pp 6-11) **Design and construction of Diamond Turning Machine No. 3.** 31 Mar 1978.

In Mechanical Engineering Department quarterly report, January—March 1978.

The Materials Fabrication Division, in conjunction with the Mechanical Engineering Research Program, is undertaking the design and construction of a new diamond turning machine. The machine, Diamond Turning Machine No. 3, is one in a series of diamond turning machines developed in the last ten years at LLL. These machines allow both turning and mirror finishing of a part during the same machine operation and have extremely high geometric accuracy. When completed in 5 years, Diamond Turning Machine No. 3 will be the world's most accurate lathe, ten times more accurate than Diamond Turning Machine No. 2. It will increase the size and weight capability from 0.8-m-diameter parts to parts with diameters up to 2.1 m and weights up to 4,500 kg. The new machine will alleviate some of the workloads of Diamond Turning Machines Nos. 1 and 2, which are currently working two shifts a day, and will provide a back up in case of an accident.

45136 (UCRL—52449) **Analytical study of intake tuning for helical-rotor expanders.** Margolis, D.L. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 20 Apr 1978. Contract W-7405-ENG-48. 14p. Dep. NTIS, PC A02/MF A01.

A mathematical model of a circular lobed helical-rotor expander has been modified to include dynamic interactions with the intake plumbing. Parametric studies were made to determine the effects of these dynamics on overall expander performance. Variations in the intake geometry produced substantial variations in expander output power for a given steady-state rotor speed; however, actual supercharging using passive intake tuning was not possible.

45137 **Suggested technique for determining in-material longitudinal and shear particle velocity histories in a single-inclined-plate impact experiment.** Swegle, J.W. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 7, 4280-4281(Jul 1978).

A technique has recently been developed for the internal measurement of longitudinal and shear particle velocity histories in an inclined-plate impact experiment. Measurements must be made in two experiments having identical impact conditions in order to uniquely determine both quantities. A modification to the technique is suggested which will allow both to be uniquely determined in a single experiment, thus avoiding the complication of having to exactly reproduce the impact configuration.

CRYOGENIC AND SUPERCONDUCTING EQUIPMENT AND DEVICES

REFER ALSO TO CITATION(S) 44634, 44834, 45099, 46084

45138 (CONF-780339—3) **Recent advances in SQUID NMR techniques.** Webb, R.A. (Argonne National Lab., Ill. (USA)). 1978. Contract W-31-109-ENG-38. 11p. Dep. NTIS, PC A02/MF A01.

From Conference on future trends in superconductive electronics; Charlottesville, VA, USA (23 Mar 1978).

A discussion of the techniques used for performing a variety of magnetic resonance experiments using a SQUID is presented. In particular, measurements of the nuclear magnetism of liquid ^{3}He in the temperature range 1.2 K to 2 mK in magnetic fields of 3.7 to 309 Oe using pulsed NMR, c-w NMR, adiabatic fast passage, and static susceptibility using the same detection system are discussed.

45139 (EPRI-EL—577) **Superconducting generator design. Final report.** Parker, J.H. Jr.; Towne, R.A. (Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Large Rotating Apparatus Div.). Nov 1977. 677p. Dep. NTIS, PC A99/MF A01.

The principal results of a detailed conceptual design study of 300 and 1200 MVA turbine generators utilizing superconducting field windings as carried out by the Westinghouse Electric Corporation are presented. Designs are reported that cover a range of reactances, e.g., the subtransient reactances range from 8 to 27% per unit. Design concepts utilized for the rotor involve an NbTi superconductor, a double-shield system, a flexible-disc thermal contraction concept, a convection-dominated helium circuit and an automatic helium level control. The armature designs are based on a new spiral winding concept which is applied at low voltage (14 kV) and at high voltage (up to 500 kV). Utilization of such a high voltage armature implies that the unit transformer can be eliminated. Refrigeration systems have been designed to match generators at both ratings. System studies have shown that the critical fault clearing time for the lower reactance superconducting generators can be appreciably longer than for conventional machines. The increased efficiency of the superconducting machines by about 0.5% plus elimination of the unit transformers with the high-voltage armature yields a life cycle savings for a utility that is equivalent to the original price of the generator. A development plan has been developed that lays out the tasks and schedule leading to the construction and utility test of a 300 MVA superconducting unit. It is concluded that the superconducting generator design is technically and economically attractive and sound; that its reliability can be made at least equal to that of present conventional units at a competitive price; and that its economic benefits extend to ratings as low as 300 MVA.

45140 (NP—23197) **6250 kVA superconducting generator.** Fujino, H.; Ishihara, A.; Ueda, K.; Shindo, Y.; Iwamoto, M.; Ogino, O.; Satow, T.; Nomura, T. (Fuji Electric Co. Ltd., Yokosuka, Kanagawa (Japan). Central Research Lab.; Mitsubishi Electric Corp., Amagasaki, Hyogo (Japan). Central Research Lab.). 1977. 5p. TIC.

Portions of document are illegible.

A 6250 kVA superconducting generator has been constructed in collaboration of Mitsubishi Electric and Fuji Electric as the main part of the three years study program of superconducting generator. The mechanical, thermal and electrical characteristics of the machine were investigated by a series of tests. On the basis of the success of this program, the next program for development of a 30 MVA superconducting synchronous condenser has been started.

45141 Numerical study of normal-zone evolution and stability of composite superconductors. Chen, W.Y.; Purcell, J.R. (General Atomic Company, P.O. Box 81608, San Diego, California 92138). *J. Appl. Phys.;* **49**: No. 6, 3546-3553(Jun 1978).

A numerical procedure has been implemented to dynamically simulate the evolution of a normal zone in a superconducting composite. The model considers the nucleate/film boiling heat transfer of helium, the effect of current sharing, the longitudinal and turn-to-turn conductions, and the temperature variation of the thermal conductivity and specific heat. For a given set of conductor parameters and initial conditions, the evolution of a zone can be followed and its behavior established as either growing or shrinking (recovering). In between these two types of behaviors, a small region exists in which stagnant zones can be observed. Limiting recovery current density J/sub L/ and heat flux Q/sub L/ tend to converge toward constant values for large L/sub N/. Turn-to-turn conduction allows higher J/sub L/ and Q/sub L/ values as compared to isolated conductor cases. The minimum quench energy is calculated and compared with experimentally measured results, and reasonable agreement is obtained if an optimistic helium heat-transfer characteristic is assumed. The experiment was carried out by Wilson and Iwasa at MIT National Magnet Laboratory.

45142 High-conductivity high-specific-heat copper for cryogenic applications. Steyert, W.A. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Appl. Phys.;* **49**: No. 6, 3612-3613(Jun 1978).

Residual resistance ratios have been measured for five different types of copper after various mechanical and thermal treatments. Inexpensive methods of fabricating wires with ratios greater than 1000 are proposed. The development of copper with a very high specific heat at 4 K as well as high electrical and thermal conductivity is reported.

45143 Method for producing a stabilized electrical superconductor. Meyer, G. (to BBC Brown Boveri and Co. Ltd.). US Patent 4,084,989. 18 Apr 1978. Priority date 12 Mar 1975, Switzerland. 6p.

A method of producing a stabilized electrical superconductor is described wherein a longitudinally extending slug is provided, the slug including a matrix of copper within which are embedded, in a central region thereof, a multiplicity of wires or rods made from a superconductor-forming material such as niobium or vanadium. Surrounding the superconductor-forming material, within the outer region of the copper matrix, is a circular array of a material such as copper wires or rods having a high electrical conductivity characteristic, forming an electrically parallel connection with the superconductors which provides a bridge of good electrical conductivity in the event the superconductivity of the superconductor is lost for any reason. The slug is then worked and drawn to convert the various wire or rod components within it into filamentary form, after which a tin layer is applied to its surface. By a heating and annealing process, the tin in the surface layer diffuses radially inward through the copper matrix and into the niobium or vanadium superconductor-forming wires or rods thus to convert the latter into superconductors. The circular array of the wires or rods having the high electrical conductivity characteristic that forms a bridge paralleling the superconductors is enclosed within a sheath of a diffusion-inhibiting material such as tantalum to prevent diffusion thereinto of the tin which would otherwise undesirably reduce their electrical conductivity.

45144 Rotor for a rotary electrical machine having a superconductive field winding. Hasegawa, K.; Nishimura, H.; Yamaguchi, K. (to Hitachi, Ltd.). US Patent 4,085,343. 18 Apr 1978. Priority date 13 Jun 1975, Japan. 8p.

A rotor for a rotary electrical machine having a superconductive field winding is described. Thermal resistance means is arranged at contact parts between a damper, which is so disposed as to cover the superconductive field winding, and a damper support supports the damper from the inner side. A plurality of protuberances are formed on either the damper support or the damper for restricting heat flow between the damper and the damper support. It is possible to cause a cooling medium to flow through interstices which are defined at the contact parts between the damper and the damper support;

45145 Transition from relaxational to "Josephson" oscillations in shunted superconducting bridges. Peskovatskii, S.A.; Strizhko, L.P. (Institute of Radiophysics and Electronics, Academy of Sciences of the Ukrainian SSR, Kharkov). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 11, 2011-2013(Nov 1977).

Bridges were produced by scratching a thin Sn film on a mica substrate. The current-voltage characteristics of these bridges were examined when a Ag strip was applied as a pressure shunt. (AIP)

45146 Current-controlled superconductive bridge contacts. Kulik, I.O.; Omel'yanchuk, A.N.; Kel'man, E.A. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 9, 537-542(Sep 1977).

A theory is offered for weakly coupled superconductive structures in which the critical bridge (film) current is varried by passing a current perpendicular to the transport current through a weak spot. Various types of such current-controlled contacts are considered (film—film, film—bridge, bridge—bridge). Josephson multiports are considered as a general case and boundary conditions are obtained for the order parameter in the weak intersection region. An expression is obtained for maximum superconductive current in the transport circuit as a function of control current. It is established that the effect of change in the maximum transport current appears at control currents close to critical, and in the resistive state of the control circuit.

PROTECTIVE STRUCTURES AND EQUIPMENT

45147 (LA—6969-PR) **Respirator studies for the DOE Division of Operational and Environmental Safety. Progress report, October 1, 1976—September 30, 1977.** Davis, T.O.; Bradley, O.; Trujillo, A.; Douglas, D.D. (Los Alamos Scientific Lab., N.Mex. (USA)). Apr 1978. Contract W-7405-ENG-36. 73p. Dep. NTIS, PC A04/MF A01.

Measurements were made of the inhalation flow rates, exhalation resistance pressures, and weights of Mining Enforcement and Safety Administration-National Institute for Occupational Safety and Health (MESA-NIOSH)-approved open-circuit self-contained breathing apparatus (SCBA). Test results are given and differences among the devices are compared. These SCBAs were also used in an experimental physiology program at the United States Air Force School of Aerospace Medicine, and a brief description of the physiology program is given. The subjective comfort of SCBA harnesses was studied, and a literature review was performed on the physiological effects of respirator use. Test procedures for supplied-air suits were improved, and tests for removal adequacy and escape time were added. A Department of Energy (DOE) contractor's 15-min escape device was tested for DOE acceptance. A study was performed on the aerosol penetration into two-piece, supplied-air suits for seven configurations and six supply airflow rates. Results are given and compared, and recommendations on suit use are given. A literature review was performed on the heat stress caused by wearing a supplied-air suit.

HANDLING EQUIPMENT AND PROCEDURES

REFER ALSO TO CITATION(S) 44273

45148 (ICP—1143) **Remote maintenance development, July 1, 1976—June 30, 1977.** Fletcher, R.D. (ed.). (Allied Chemical Corp., Idaho Falls, Idaho (USA). Idaho Chemical Programs - Operations Office). May 1978. Contract EY-76-C-07-1540. 57p. Dep. NTIS, PC A04/MF A01.

Results of the remote handling and remote maintenance development for the New Waste Calcining Facility (NWCF) from July 1, 1976, through June 30, 1977, are presented. Specific test arrangements and results for remote maintenance of samplers, cell lights, tool ports, etc., in the Remote Maintenance Development Facility (RMDF) are discussed.

45149 (NUREG/CR—0073) **Critical separation between subcritical clusters of 4.29 wt % ^{235}U enriched UO_2 rods in water with fixed neutron poisons.** Bierman, S.R.; Durst, B.M.; Clayton, E.D. (Battelle Pacific Northwest Labs., Richland, Wash. (USA)). Mar 1978. Contract EY-76-C-06-1830. 32p. Dep. NTIS, PC A03/MF A01.

Measurement data are presented from a series of criticality experiments on systems simulating fuel element shipping containers and fuel storage basins. The conditions investigated involve clusters of 4.29 wt% ^{235}U enriched UO_2 fuel rods immersed in water. The number of rods required for criticality in a square lattice spacing (25.4 mm) near optimum neutron moderation and the critical separation between three subcritical clusters aligned in a row was determined. The effect that the following fixed neutron absorbers had on this critical separation was also measured: 304L steel with 0, 1.1, and 1.6 wt% boron; boral; copper with 0 and 1 wt% cadmium; cadmium; aluminum; and zircaloy-4. The fuel rods are 12.649 mm in dia, clad in 0.660 mm thick, 12.827 mm ID aluminum tubing and varied in length from 914 mm to 927 mm. The neutron absorbers are in the form of plates and are positioned between the fuel clusters such that no line of sight existed between the clusters. Measurements were made with each absorber plate located approximately midway between the fuel clusters and with the plates near the respective cell boundary of the center fuel cluster.

45150 (PNL—2700) **Handbook of critical experiments benchmarks.** Durst, B.M.; Bierman, S.R.; Clayton, E.D. (Battelle Pacific Northwest Labs., Richland, Wash. (USA)). Mar 1978. Contract EY-76-C-06-1830. 68p. Dep. NTIS, PC A04/MF A01.

Data from critical experiments have been collected together for use as benchmarks in evaluating calculational techniques and nuclear data. These benchmarks have been selected from the numerous experiments performed on homogeneous plutonium systems. No attempt has been made to reproduce all of the data that exists. The primary objective in the collection of these data is to present representative experimental data defined in a concise, standardized format that can easily be translated into computer code input.

45151 Problems of dismantling, treating and analyzing highly irradiated fuel elements. Lefort, G.; Hayet, L.; Regnaud, F. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)); Allain, A. (Compagnie d'Ingenierie pour les Reacteurs au Sodium (CIRNA), Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Calame-Longjean, A. (CEA Centre de Marcoule, 30 - Bagnols-sur-Ceze (France)); Moreau, C. (Ateliers et Chantiers de Bretagne (ACB), 44 - Nantes (France)). pp 119-140 of Design of and equipment for hot laboratories. Vienna; IAEA (1976). (In French)

From Symposium on the design of and equipment for hot laboratories; Otaniemi, Finland (2 Aug 1976).

For some years hot laboratories have been receiving highly irradiated fuel elements from experimental reactors and new-generation power reactors. The hazards associated with these fuel elements are greater than those encountered in the past and it has been necessary to re-equip numerous facilities, improving the techniques used and the precautions taken in respect of personnel so that the operating conditions remain satisfactory. The operation of well-designed facilities doing this type of work has in fact become safer. Four representative facilities are described as examples - a dismantling cell with an inert atmosphere, associated with the Phenix reactor, a mechanical chopper cell for oxide fuel elements installed at the head of a pilot reprocessing plant, a radiometallurgy laboratory handling breeder fuel elements and californium, and a facility for chemical analysis of fuel elements. The paper shows that proper control has been established over the different hazards inherent in this type of facility in normal operation and in emergency conditions. These results are confirmed by the conditions of operation with teams having very long experience.

SHIPPING CONTAINERS

45152 (LA-UR—78-1210) **Cargo response to railcar impact and tiedown load analysis.** Bartholomew, R.J. (Los Alamos Scientific Lab., N.Mex. (USA)). 1978. Contract W-7405-ENG-36. 10p. (CONF-780506—10). Dep. NTIS, PC A02/MF A01.

From 5. symposium on packaging and transportation of radioactive materials; Las Vegas, NV, USA (7 May 1978).

Portions of document are illegible.

An analytical study that investigated the loads produced during coupling of railcars carrying heavy shipping containers is described. The structural model of the impact event is represented by a lumped parameter technique. Each discrete mass lump possesses longitudinal, vertical, and rotational degrees of freedom. The resulting computer simulation provides for nonlinear railcar coupler stiffness and linear damping forces in the coupler and container tiedowns. Results include response to parametric variations in container weight, impact speed, and tiedown stiffness. Container dynamic response and tiedown loads are found to depend heavily on these parameters. Also, railcar bending and subsequent vertical motion are shown to be important contributors to these responses. When experimentally substantiated, the model can serve as a useful tool in the design and evaluation of shipping container tiedown structures.

45153 (SAND—77-1415C) **Parametric evaluation of heat transfer and coolant options for breeder reactor spent fuel shipping casks designs.** Pope, R.B.; Reed, A.W. (Sandia Labs., Albuquerque, N.Mex. (USA)). 1978. Contract EY-76-C-04-0789. 9p. (CONF-780506—19). Dep. NTIS, MF A01.

From 5. symposium on packaging and transportation of radioactive materials; Las Vegas, NV, USA (7 May 1978).

Portions of document are illegible.

It is concluded that the long term shipping needs of the U. S. Breeder Reactor Program can best be met by fabricating a SFSC which has a solid basket with circular openings, each of which will accept either uncanistered uncleaned fuel assemblies or canistered assemblies. The cask should be capable of containing pressurized helium, and should have sufficient neutron and gamma shielding which will allow twelve assemblies, each producing a minimum of 4 kW of decay heat, to be shipped. Thermal analyses indicate this cask could be used to ship 12 uncanistered assemblies each producing approximately 1 kW of decay heat. Alternatively, 9 assemblies canistered in helium each producing approximately 2.0 to 2.5 kW of decay heat, or 12 assemblies canistered in a liquid such as sodium, each producing 4 kW or more of decay heat could be shipped.

45154 Examination on neutron shielding for a spent fuel shipping cask. Ueki, K.; Yamakoshi, H.; Takeuchi, K. (Ship Research Inst., Tokyo). pp 660-667 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

A Monte Carlo transport code, FLASK for shielding calculation of three dimensional and multi-material configurations was developed to calculate neutron energy distributions at boundaries of shielding layers. Two cases were examined with the FLASK and PALLAS-2D-CY Codes to minimize dose rate of neutron around a shipping cask. Neutron cross section data are provided from the ENDF/B-III and -IV libraries. The first examination is the estimation of thermal neutron absorption effect of ^{10}B or Gd layer, inserted around spent fuel assemblers in the water cavity. The effect is evaluated from the change of neutron energy distributions at inner boundary of the inserted layer. The second examination is the estimation of neutrn shielding effect of ^{10}B or Gd layers, inserted between outer boundary of the water cavity and inner boundary of the lead shield. Neutron energy distributions are calculated at inner and outer boundaries of inserted layers and at boundary of lead shield, where water thickness and layer thickness are chosen as parameters. The use of materials such as ^{10}B and Gd are inevitable for shipping a lot of high burnup spent fuels by a cask because these materials have high absorption cross sections for thermal and slow neutrons. This strong neutron absorption is effective for keeping neutron multiplication to a low level.

TRANSPORT AND STORAGE FACILITIES

REFER ALSO TO CITATION(S) 44189, 45152

45155 (CED—78-99) **Pipeline safety: need for a stronger Federal effort.** Eschwege, H. (General Accounting Office, Washington, D.C. (USA)). 26 Apr 1978. 25p. General Accounting Office, Washington, DC.

Testimony is presented that was given on Feb. 27, 1978, before the Senate Committee on Commerce, Science and Transportation, on the results of a General Accounting Office review of the Federal pipeline safety program. The review identifies a number of significant problems and weaknesses in the program and recommends remedial actions. (TFD)

MINING AND DRILLING EQUIPMENT AND FACILITIES

REFER ALSO TO CITATION(S) 44099, 44118

LASERS

REFER ALSO TO CITATION(S) 46109, 46120, 46121, 46123, 46124

45156 (AD-A—048361) **Effects of gamma radiation on gallium-arsenide lasers. Master's thesis.** Ackermann, H. (Air Force Inst. of Tech., Wright-Patterson AFB, Ohio (USA). School of Engineering). Dec 1977. 64p. (AFIT/GEP/PH—77-1). NTIS PC A04/MF A01.

The effect of gamma radiation from a Co60 source on the performance of two types of aluminum gallium arsenide injection lasers was investigated. Both types of lasers were designed to operate in the continuous wave mode at room temperature. Measurements were conducted to determine radiation induced changes in the threshold current, power output, efficiency, and spectral and intensity distributions. Damage factors were calculated by the constant voltage and constant current methods. Type C30127 (RCA) exhibited rapid degradation. A dosage of 10000 Rad(Si) reduced the output power by a factor of two. Threshold current increased, efficiency decreased, and the intensity distribution changed drastically. The damage factor at constant voltage was calculated. The performance of LCW-10 (Laser Diode Laboratories, Inc.) improved to a dosage of meg a rad (Si) before the onset of degradation.

45157 (AD-A—048447) **Boundary layer effects in chemical laser nozzle inlet. Interim report.** Mirels, H.; Liu, S.W. (Aerospace Corp., El Segundo, Calif. (USA). Ivan A. Getting Labs.). 8 Nov 1977. Contract F04701-77-C-0078. 31p. NTIS PC A03/MF A01.

Fluorine atom recombination and heat loss to the wall are investigated in the inlet and supersonic expansion region of typical cw chemical laser nozzles. It is concluded that the major losses occur in the inlet section. Expressions given for estimating these losses are based on zero pressure gradient flows with unit Prandtl and Schmidt numbers. For typical geometries, a plenum temperature T sub o = 1500°K, and plenum pressures in the range 1 < or = p sub o, atm < or = 10, the reduction of total enthalpy at the downstream end of the inlet section varied from about 10% to 30%. The reduction within the actual boundary layer mass flow is approximately 40% for a boundary layer thickness defined such that U/u sub e = 0.9, where u and u sub e denote local and free-stream velocities, respectively. It is concluded that these losses should be considered when cw chemical laser performance is being estimated or analyzed.

45158 (AD-A—048621) **Ion plasma electron gun research. Final report, 1 June—15 November 1977.** Clark, W.M. Jr.; Palmer, A.J. (Hughes Research Labs., Malibu, Calif. (USA)). 9 Dec 1977. Contract N00014-77-C-0484. 39p. NTIS PC A03/MF A01.

Experiments have been run and a comprehensive theoretical model developed which have enabled a more complete characterization of the ion plasma electron gun. The experiments provided important high current data on the operation of the gun and of the thin-wire discharges. The theoretical model included consideration of fifteen different reactions between helium atoms and ions and electrons and calculated the particle fluxes and the electric potential as a function of position in the high-voltage region. These calculated quantities described accurately the behavior of the gun at a beam voltage of 110 kV and enable a projection of operation of the e-gun at high voltages, such as 400 keV, with a beam current of 10 A/cm^2 where the gun will be useful to pump excimer lasers. A qualitative understanding was obtained of the transient behavior of both the e-gun and of the scaling properties of the thin-wire discharges.

45159 (AD-A—048643) **Research on molecular lasers. Final report, 1 October 1968—30 September 1976.** Wolga, G.J.; Cool, T.A.; Bauer, S.H.; McFarlane, R.A. (Cornell Univ., Ithaca, N.Y. (USA)). 31 Aug 1977. Contract N00014-76-C-0426. 24p. NTIS PC A02/MF A01.

The broad objectives of this research were to provide quantitative information concerning molecular and chemical lasers. The parameters dealt with were: new laser transitions and pumping schemes; laser gain and saturation parameters; measurements of relaxation and energy transfer between the translational, rotational, vibrational, and electronic modes of prominent laser molecules.

45160 (AD-A—048662) **Manufacturing methods and technology engineering for neodymium-doped YAG laser rods. Quarterly progress report No. 2, 1 June—31 August 1977.** Dentz, D. (Litton Systems, Inc., Morris Plains, N.J. (USA). Airtron Div.). Oct 1977. Contract DAAB07-77-C-0375. 18p. NTIS PC A02/MF A01.

The polishing fixture designed to hold sixteen rods during fabrication was received during this quarter. Using this fixture several lots of rods were processed to evaluate the proposed polishing process. Process data, times and yields were obtained. Rods were measured for adherence to specifications and data collected as a function of rod position with the block.

45161 (AD-A—048779) **Chemical laser potential of selected group IV-A metal oxides. Final report.** Linevsky, M.J.; Carabetta, R.A. (General Electric Co., Philadelphia, Pa. (USA). Space Div.). Nov 1977. Contract F29601-76-C-0055. 69p. NTIS PC A04/MF A01.

This program consists of two parts. In the first part, which represents a continuation of the earlier flame work, attempts were made to produce high column densities of Sn/SnO, Si/SiO and Ge/GeO in H_2/N_2O flames containing metal additives. Quantitative measurements on the kinetic behavior of these species were carried out to determine their lasing potential in this environment. In the second part, detailed measurements on the reactions of Sn(P_{3_0}) and (P_{3_1}) with N_2O were carried out using a fast flow reactor and a tin atom generator. Rate constants of processes bearing on the production and quenching of SnO(3 sigma) were determined.

45162 (CONF-780202—21) **$TbCl_3$—$AlCl_3$ vapors: characteristics of a potential new high energy gas phase laser medium.** Caird, J.A.; Hessler, J.P.; Carnall, W.T.; Williams, C.W.; Lance-Gomez, T. (Argonne National Lab., Ill. (USA)). 1978. Contract W-31-109-ENG-38. 7p. Dep. NTIS, PC A02/MF A01.

From Topical meeting on inertial confinement fusion; San Diego, CA, USA (7 Feb 1978).

The absorption and fluorescence spectra, excited state lifetimes and ion densities of $TbCl_3$-$AlCl_3$ vapors have been measured. The temporal evolution of $^5D_4$ fluorescence is analyzed.

45163 (COO—2922-1) **Visible laser discharge studies. Quarterly progress report, December 1, 1976—February 28, 1977.** Srivastava, B.N.; Jacob, J.H.; Mangano, J.A. (Avco-Everett Research Lab., Everett, Mass. (USA)). 1977. Contract EY-76-C-02-2922. 15p. Dep. NTIS, PC A02/MF A01.

The following investigations were made in order to establish the accuracy of the Boltzmann code reported earlier: (1) test cases in order to determine the accuracy of the code when electron-electron and superelastic collisions are not included (the code predictions are compared with published results); (2) investigation of the effects of superelastic collisions (an example using krypton and krypton metastables is presented); and (3) investigation of the effects of electron-electron collisions (for this case also a typical example of krypton and krypton metastables is presented). In order to investigate the accuracy of the present code when electron-electron and superelastic collisions are neglected; two cases were investigated. The first case was that of argon and the second case was that of helium. The cross-sections and some experimental data for these gases are readily available from literature.

45164 (COO—2922-3) **Visible laser discharge studies. Quarterly progress report, June 1, 1977—August 31, 1977.** Srivastava, B.N.; Jacob, J.H.; Mangano, J.A. (Avco-Everett Research Lab., Everett, Mass. (USA)). 1977. Contract EY-76-C-02-2922. 21p. Dep. NTIS, PC A02/MF A01.

In order to facilitate the development of metal vapor excimer lasers for inertial fusion, a theoretical study has been undertaken to identify the dominant discharge physics and kinetics for metal vapor excimers like cadmium-mercury (CdHg). Interest in such lasers have been heightened since the reported observation of gain in CdHg. An efficient method of pumping the first excited state of metal vapors is by secondary electrons created in a discharge. By discharge pumping it is possible to create mainly the lowest excited state, thereby minimizing highly excited electronic states that could photoabsorb. E-beam pumping may have difficulty in pumping metal vapor excimers due to photoabsorption by excited species. To obtain high efficiencies for CdHg system by discharge pumping three technical issues must be addressed: (1) inefficiencies in discharge pumping due to energy flow into excited states; (2) discharge stability; and (3) efficient discharge enhancement. The present effort is directed to the above issues through the development of a kinetics code that models the dominant kinetics of CdHg laser system. The bulk of the report is devoted to identification of inefficiencies in discharge pumping due to energy flow into excited states. The analysis can also be used to predict discharge stability and discharge enhancement.

45165 (COO—4251-6) **Efficient high energy infrared third harmonic generation in gases and liquids for laser fusion applications. Annual progress report, 1 March 1977—28 February 1978.** Kildal, H.; Brueck, S.R.J. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). Mar 1978. Contract ES-77-S-02-4251. 32p. Dep. NTIS, PC A03/MF A01.

This report covers work performed over the period 1 March 1977 to 28 February 1978 on Efficient High Energy Infrared Third Harmonic Generation (THG) in Gases and Liquids for Laser Fusion Applications. The major accomplishments have included: (a) Achievement of 2% THG power conversion efficiency (using 120

nsec pulses in liquid $CO-O_2-SF_6$ mixtures). (b) Development of phasematching techniques for THG. (c) Sum frequency generation in liquid $CO-O_2$ mixtures. (d) Measurements of liquid CO two-photon resonance parameters in various diluents. (e) Experimental verification of the calculated third order susceptibility for different CO concentrations. (f) Measurements of laser induced breakdown parameters in cryogenic liquids. (g) Theoretical analysis of limitations due to two-photon absorption, resonant and non-resonant Kerr effect, Stark shifting, power broadening, and stimulated Brillouin scattering. (h) Development of cell length and pulse duration scaling laws for the THG efficiency. (i) Construction of a 1-10 nsec pulse duration CO_2 laser facility and characterization of the mode quality using the tripling process. (j) Theoretical analysis of alternate systems for tripling of CO_2 laser radiation. (k) Theoretical analysis of HF gas as a tripling medium for HF laser radiation.

45166 (LA-UR—78-931) **Damage resistance of coated optics for pulsed CO_2 lasers.** Newnam, B.E. (Los Alamos Scientific Lab., N.Mex. (USA)). 1978. Contract W-7405-ENG-36. 18p. (CONF-780324—5). Dep. NTIS, PC A02/MF A01.

From SPIE '78 seminars; Washington, DC, USA (28 Mar 1978).

The influence of various factors on the damage threshold of coated optical components used in high-power, pulsed CO_2 lasers is reviewed. The factors considered are substrate roughness and polishing defects, coating defects, linear absorption, deposition parameters, standing-wave electric fields, pulsewidth dependence, multiple-shot conditioning, and optical performance. Experimental results of many researchers are used to illustrate the discussions.

45167 (N—77-33514) **Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2. Further development and optimization of the chemical CO-laser.** Daree, K. (Institut Franco-Allemand de Recherches de Saint-Louis, 68 (France)). 22 Dec 1976. 153p. (ISL-R—137/76). NTIS PC A08/MF A01.

The emission of a pulsed chemical CO laser was investigated using numerical calculations and experimental data, and possibilities of increasing the output energy and power are discussed. The effect of pressure, temperature, and mixing ratio was calculated for the chemical reaction of CS2 and O2. The calculated CO production rate was used in a model, allowing 340 coupled laser transitions, to calculate the output power of the chemical laser. Relaxation processes between molecules in the laser are taken into account, and their influence is discussed. A comparison with spectrally and timely resolved power measurements shows that the model used is suitable for describing the laser system. Conclusions are obtained in regard to the optimal design of high power CO lasers.

45168 Nonlinear generation of Lyman-alpha radiation. Mahon, R.; McIlrath, T.J.; Koopman, D.W. (Institute for Physical Science and Technology, University of Maryland, College Park, Maryland 20742). *Appl. Phys. Lett.;* **33**: No. 4, 305-307(15 Aug 1978).

Tunable narrow-band Lyman-alpha radiation (~1216 A) has been generated by frequency tripling in krypton. A near-diffraction-limited tunable 15-nsec 10-MW input at 3648 A was used to generate ~3.6 x 10^{11} photons (60 W) per pulse at 1216 A. Measurements of the output as a function of gas pressure give the refractive index for krypton at 1216 A, demonstrating its negatively dispersive character.

45169 Inversion of the Na resonance line by selective photodissociation of NaI. White, J.C. (Edward L. Ginzton Laboratory, W. W. Hansen Laboratories of Physics, Stanford University, Stanford, California 94305). *Appl. Phys. Lett.;* **33**: No. 4, 325-327(15 Aug 1978).

This letter reports the inversion and intense superfluorescent emission of the Na resonance line by selective photodissociation of NaI. The fifth harmonic of a Q-switched Nd:YAG laser at 2128 A was used to photodissociate NaI to the unbound state Na(3p ^{2}P)+I(5p^5 ^{2}P/sub 3/2/). Superfluorescence at the 5896-A resonance line was observed.

45170 Intense proton-beam-pumped Ar-N_2 laser. Golden, J.; Eden, J.G.; Mahaffey, R.A.; Pasour, J.A.; Ali, A.W.; Kapetanakos, C.A. (Naval Research Laboratory, Washington, D.C. 20375). *Appl. Phys. Lett.;* **33**: No. 2, 143-146(15 Jul 1978).

Gas laser action using a current and space-charge-neutralized proton beam as a pump source has been demonstrated. Stimulated emission at 357.7 and 380.5 nm, corresponding to the $v'=0\rightarrow v''=1$ and $v'=0\rightarrow v''=2$ transitions of the N_2 (C→B) band, has been observed in $Ar/5\%N_2$ gas mixtures. In comparison with electron beams, protons appear to be more efficient for excitation sources of high-pressure uv and visible lasers.

45171 Mode-locked krypton ion laser with a 50-psec pulse width in the near uv. Steinmetz, L.L.; Richardson, J.H.; Wallin, B.W. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). *Appl. Phys. Lett.;* **33**: No. 2, 163-165(15 Jul 1978).

The mode-locked near-uv output from a krypton ion laser is characterized and shown to produce near-transform-limited picosecond pulses. Applications to time-resolved fluoresence studies for chemical analysis are included.

45172 Photodissociation lasers using forbidden transitions of selenium atoms. Powell, H.T.; Ewing, J.J. (Advanced Lasers Group, Lawrence Livermore Laboratory, Livermore, California 94550). *Appl. Phys. Lett.;* **33**: No. 2, 165-167(15 Jul 1978).

Weak laser oscillation has been demonstrated on the 489- and 777-nm electric-dipole-forbidden $^1S_0—^3P_1$ and $^1S_0—^1D_2$ transitions of the selenium atom. Carbonyl selenide has been photolyzed at 172 nm by Xe^*_2 radiation to produce the $Se(^1S_0)$ excited state.

45173 Energy ordering of the excited states of XeF. Kligler, D.; Nakano, H.H.; Huestis, D.L.; Bischel, W.K.; Hill, R.M.; Rhodes, C.K. (Molecular Physics Laboratory, SRI International, Menlo Park, California 94025). *Appl. Phys. Lett.;* **33**: No. 1, 39-41(1 Jul 1978).

$Ar/Xe/NF_3$ mixtures were excited by the focused beam from an ArF (193 nm) laser. Xe^+ ions are produced by two-photon ionization, the electrons attach to make F^-, and the ions recombine to make XeF^*. Radiation is observed in the XeF(B 1/2) →XeF(X 1/2) bands near 351 nm and in the broader XeF(C 3/2) →XeF(A 3/2) band near 460 nm. At low background gas pressure, mostly B-X uv emission is observed. As the argon pressure is increased to 1000 Torr, the visible/uv band intensity ratio increases to about 3 to 1. We conclude from these results that the C (3/2) state lies 700 +- 70 cm~1 below the B (1/2) state. This conclusion should have a significant impact on our understanding of the fluorescence yields and laser performance of e-beam-excited XeF.

45174 Covalent and ionic states of the rare gas monofluorides. Dunning, T.H. Jr.; Hay, P.J. (Chemistry—Nuclear Chemistry and Theoretical Divisions, Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *J. Chem. Phys.;* **69**: No. 1, 134-149(1 Jul 1978).

Ab initio configuration interaction calculations have been carried out on the electronic states of RgF (Rg=Ne, Ar, Kr, and Xe) arising from the covalent, $Rg(^1S)+F(^2P)$, and ionic, $Rg^+(^2P)+F^-(^1S)$, separated atom limits. Spin—orbit effects, which have been shown to be important in the ionic states, are included in a semiempirical manner. The potential curves of all of the covalent states were found to be repulsive, while those of the ionic states were strongly bound (D/sub e/~5—6 eV). Only those transitions for which $\Delta\Omega=0$ were found to be strong. The intense laser emissions at 193 nm in ArF, 248 nm in KrF, and 352 nm in XeF all arise from a transition between the lowest ionic $\Omega=1/2$ state and the lowest covalent $\Omega=1/2$ state (III1/2—X1/2 in our notation). The calculated lifetimes of the III1/2—X1/2 laser transition varies from 2.6 nsec (NeF) to 12 nsec (XeF).

45175 Spectroscopic studies of diatomic noble gas halides. III. Analysis of XeF 3500 A band system. Tellinghuisen, J.; Tellinghuisen, P.C.; Tisone, G.C.; Hoffman, J.M.; Hays, A.K. (Department of Chemistry, Vanderbilt University, Nashville, Tennessee 37235). *J. Chem. Phys.;* **68**: No. 11, 5177-5186(1 Jun 1978).

B→X spontaneous and stimulated emission spectra of XeF have been photographed at medium resolution (2.0 A/mm) and vibrationally analyzed. The assignments are made with the aid of trial-and-error Franck—Condon calculations and band profile simulations, which are described in detail. The strong laser emission near 3511 A is primarily due to densely overlapped rotational lines in the 1—4 vibronic band, and that near 3532 A probably includes numerous rotational transitions in the 0—2, 0—3, and 1—6 bands.

45176 Spectroscopic studies of diatomic noble gas halides. IV. Vibrational and rotational constants for the X, B, and D states of XeF. Tellinghuisen, P.C.; Tellinghuisen, J.; Coxon, J.A.; Velazco, J.E.; Setser, D.W. (Department of Chemistry, Vanderbilt University, Nashville, Tennessee 37235). *J. Chem. Phys.;* **68**: No. 11, 5187-5198(1 Jun 1978).

The B→X and D→X systems of XeF are recorded by photographing the emission from the low-pressure Xe^*/XeF_2 and Ar^*/XeF_2 reactions. A rotational analysis is obtained for the 1—2 band of B—X, for which isotopic blending is negligible. Vibrational parameters for the X, B, and D states are derived from a direct, weighted least-squares fit of all assignments for both transitions. Rotational parameters are deduced from the vibrational dependence of the band shapes and intensities. Some significant results of this analysis are R/sub e/X=2.293 A, R/sub e/B=2.631 A, R/sub e/D=2.51 A, ω/sub e/X=225 cm~1, ω/sub e/B=309.0 cm~1, ω/sub e/D=350.1 cm~1, and D/sub e/X=1175 cm~1. The Franck—Condon factors for many of the bands in both systems show a strong rotational dependence, which is to be expected in transitions of this type, for reasons discussed herein.

45177 Spontaneous explosions in multiatmosphere H_2-F_2-O_2 mixtures. Truby, F.K. (Sandia Laboratories, Albuquerque, New Mexico 87185). *J. Appl. Phys.;* **49**: No. 6, 3481-3484(Jun 1978).

Explosion studies in multiatmosphere H_2-F_2-O_2 mixtures show that the pressures at which such mixtures spontaneously explode are greatly affected by treatment of the explosion cell surfaces prior to filling the cell with H_2-F_2-O_2 mixtures. This strong effect of surface conditioning indicates that the observed explosions in H_2-F_2-O_2 mixtures (covering a wide range in $[F_2]/[H_2]$ ratios) with total pressures up to 10 atm result from surface-associated initiation processes rather than from purely volume-initiated third-limit processes. These results agree with a kinetic model involving H_2O_2 production with a chain formation of H_2O at the surface.

45178 1/4-J discharge pumped KrF laser. Sze, R.C.; Scott, P.B. (University of California, Los Alamos Scientific Laboratory, P.O. Box 1663, Los Alamos, New Mexico 87545). *Rev. Sci. Instrum.;* **49**: No. 6, 772-774(Jun 1978).

Over 1/4-joule per pulse is obtained from a cable-fed uv preionized discharge device where a faster energy deposition rate compensates for a slower voltage rise time. These slower voltage rise-time devices may be scalable to high repetition rates using conventional thyratron switching techniques.

45179 Distributed aperture effect in laser rods with negative lenses. Barnes, N.P.; Scalise, S.J. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Appl. Opt.;* **17**: No. 10, 1537-1540(15 May 1978).

Negative lenses have been ground on the ends of laser rods to increase the TEM_00 mode volume. With the negative lenses on the ends, the laser rod acts like a distributed aperture. The distributed aperture radius and its effect on the useful volume of the laser rod are calculated. The mode radius and the diffraction loss for a laser rod with negative lenses ground on the ends are presented as a function of laser rod focal length and the Fresnel number.

45180 Measurement of 16-μm emission of a two-photon-excited ammonia laser. Flicker, H.; Holland, R.F.; Bischel, W.K.; Pummer, H.; Rhodes, C.K. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Appl. Phys.;* **49**: No. 5, 2983(May 1978).

The emission wavelengths at 16 μm of a two-photon-excited ammonia laser has been measured with improved accuracy. The measurement technique involves accurate calibration of the monochromator using well-known spectral lines and boxcar amplifiers to measure the total laser energy per laser pulse and the energy transmitted through the monochromator.

45181 Efficient intracavity laser Raman spectrometer. Hercher, M.; Mueller, W.; Klainer, S.; Adamowicz, R.F.; Meyers, R.E.; Schwartz, S.E. (Block Engineering, Inc., 19 Blackstone Street, Cambridge, Massachusetts 02139). *Appl. Spectrosc.;* **32**: No. 3, 298-302(May 1978).

The design of an optimized intracavity laser Raman spectrometer is described, and representative Raman scattering data are presented. An intracavity laser power of 160 W was attained with an argon ion laser whose normal output power was 1 W.

45182 Advances in cleaning metal and glass surfaces to micron-level cleanliness. Stowers, I.F. (Lawrence Livermore Laboratory, Livermore, California 94550). *J. Vac. Sci. Technol.;* **15**: No. 2, 751-754(Mar 1978).

A high-pressure 6.9-MPa liquid spraying technique has been developed to remove small (>5 μm) contaminant particles from large (100 m^2) surface areas. Chemically polished and etched 304 stainless-steel components are solvent sprayed to achieve cleanliness levels of less than 10 particle/cm^2 >5 μm diameter. The high-pressure and high-liquid-velocity cleaning technique can remove 99.9% of >5-μm-diam particles in 5—10 s compared to only 20—60% >5-μm particles by ultrasonic cleaning in 2—10 min. High levels of particulate cleanliness are required for large solid—state laser systems where contaminants may migrate to optical surfaces and cause severe pitting. The pitted glass must be removed and periodically repolished to maintain acceptable beam quality. Special Class 100 clean room procedures and equipment have been developed to determine the degree of cleanliness of laser components and to maintain cleanliness during installation and operation. Development of these cleaning procedures resulted in greatly reduced failure rates for solid-state disk amplifiers. Although developed specifically for cleaning optical components, the basic technique should find wide application in any field requiring particulate-free surfaces.

45183 (UCRL-Trans—11348) **Energetic, report No. 1.** Mar 1978. Translation: source information not available. 23p. Dep. NTIS, PC A02/MF A01.

Research progress is reported on the development of a first-stage laser amplifier with discs 200 mm in diameter, with a pumping yield of at least 1%. (TFD)

45184 (UCRL-Trans—11349) **Energetic, report No. 3.** Mar 1978. Translation: source information not available. 15p. Dep. NTIS, PC A02/MF A01.

Research progress is reported on the development of a first-stage laser amplifier with discs 200 mm in diameter, with a pumping yield of at least 1%. (TFD)

45185 (UCRL-Trans—11351) **Energetic, report No. 2.** Mar 1978. Translation: source information not available. 29p. Dep. NTIS, MF A01.

Portions of document are illegible.

Research progress is reported on the development of a first-stage laser amplifier with discs 200 mm in diameter, with a pumping yield of at least 1%. (TFD)

45186 Laser Pb/sub 1hyphenx/Sn/sub x/Te heterostructures. Girich, B.G.; Gureev, D.M.; Zasavitskii, I.I.; Koropotkina, T.I.; Kulygina, E.P.; Matsonashvili, B.N.; Nikolaev, M.I.; Pelevin, O.V.; Flusov, G.V.; Shotov, A.P. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. Phys. - Semicond. (Engl. Transl.);* **11**: No. 1, 70-72(Jan 1978).

Heterostructures of various types were made of Pb/sub 1hyphenx/Sn/sub x/Te solid solutions grown by liquid epitaxy and lasers were fabricated from these structures. The threshold currents and emission spectra of the lasers were determined. The threshold current densities at temperatures of 4.2, 20.3, and 77.4°K were about 0.2, 0.35, and 7.7 kA/cm^2, respectively. At liquid helium temperatures the investigated heterostructure lasers operated continuously. Depending on the compositon of the active layer, the laser emission wavelength ranged from 10 to 20 μ. A study was made of the properties of Pb/sub 0.8/Sn/sub 0.2/Te epitaxial films (photoluminescence intensity, structure "perfection," and carrier density) as a function of the growth temperature. Factors responsible for the displacement of the p-n junction away from the heterostructure interface were considered.

45187 Observable manifestations of phase transitions in lasers. Salomaa, R.; Stenholm, S. (Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Technical Physics). *Appl. Phys.;* **14**: No. 4, 355-360(Dec 1977).

The well-known analogy between the theory of phase transitions and lasers is discussed. It is shown that the ac-response of the output intensity to the modulation of the passive cavity losses gives an appealing correspondence to the specific heat. Experiments performed with a laser having an intracavity absorber are described to illustrate the first-order analogy.

45188 Measurements of some reaction rates of importance in KrF lasers. Shaw, M.J.; Jones, J.D.C. (University Coll. of Wales, Aberystwyth (UK). Dept. of Physics). *Appl. Phys.;* **14**: No. 4, 393-398(Dec 1977).

A flowing afterglow method has been used to study a number of reactions of importance in KrF lasers using NF_3 as the fluorine donor. Total rate constants are reported for $Kr^*(^3P_2) + NF_3$ and $Kr^+ + NF_3$. The thermal energy attachment coefficient has been measured for NF_3 and the cross section for the electron excitation process $Kr^*(^3P_2) + e \rightarrow Kr^*(^3P_1) + e$ has been estimated. The relevance of these results to discharge pumped KrF lasers is discussed.

45189 High-power single-mode cw dye ring laser. Schroeder, H.W.; Stein, L.; Froelich, D.; Fugger, B.; Welling, H. (Technische Univ. Hannover (Germany, F.R.). Inst. fuer Angewandte Physik). *Appl. Phys.;* **14**: No. 4, 377-380(Dec 1977).

Due to spatial hole burning, standing-wave dye lasers require a large amount of selectivity inside the cavity for single-mode operation. The output power of these lasers is limited by losses caused by the frequency selecting elements. In a travelling-wave laser, on the other hand, spatial hole burning does not exist, thereby eliminating the need for high selectivity. A travelling-wave cw dye laser was realized by unidirectional operation of a ring laser, yielding single mode output powers of 1.2 W at 595 nm and of 55 mW in the UV-region with intracavity frequency doubling.

45190 Electron-beam-controlled gas-flow CO_2 laser. Bonnet, J.; Fournier, G.; Pigache, D. (Office National d'Etudes et de Recherches Aerospatiales (ONERA), 92320 Chatillon, France). *Sov. J. Quant. Electron. (Engl. Transl.);* 7: No. 12, 1451-1454(Dec 1977).

Solutions are obtained describing cw and pulse-periodic lasing regimes in a CO_2 laser with high mean output power. In the pulse-periodic regime the mean power and the repetition frequency are at present limited to 450 W and 33 Hz in a 40 x 10 x 10 cm discharge. The laser properties are all described accurately by theoretical expressions obtained on the basis of a four-temperature model. The use of this model, together with the gasdynamic equations, provides a reliable method of predicting the operation of a supersonic-flow laser in the cw regime.

45191 Acousto-optic Q switches for YAG:Nd lasers. Nowicki, M.; Niechoda, Z.; Wolinski, W.; Gackowska, G. (Institute of Electronic Technology, The Polytechnic, Warsaw, Poland). *Sov. J. Quant. Electron. (Engl. Transl.);* **7**: No. 12, 1512-1514(Dec 1977).

A report is given of the development and of tests on a Q switch for continuously pumped YAG:Nd lasers. The switch operates in the Raman-Nath diffraction range. The results are given of a study of the propagation of acoustic waves in such a switch, and also of the acoustic and electrical matching of all the parts of the switch. It is shown that the presence of a reflected acoustic wave in an optical medium is an undesirable effect.

45192 Some ways of improving the energy characteristics of lamp-pumped dye-solution lasers. Smirnov, V.S.; Bakhshiev, N.G. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 6, 697-698(Dec 1977).

45193 Organic-dye attachment for converting the wavelength of the radiation of pulsed solid-state and gas lasers. Batishche, S.A.; Isyanova, E.D.; Korda, I.M.; Mostovnikov, V.A.; Motkin, V.S.; Moshchennikov, Y.V.; Myshalov, P.I.; Ovchinnikov, V.M.; Rubinov, A.N.; Sakaev, R.I. *Sov. J. Opt. Technol. (Engl. Transl.);* **44**: No. 12, 726-728(Dec 1977).

A commercial model of an attachment that employs organic dye solutions for converting the radiation wavelength of pulsed solid-state and gas lasers into radiation of any wavelength within the interval from 340 to 1200 nm has been developed. The attachment operates in several modes, providing a spectral width of 10^{-3} to 10 nm for the generated radiation.

45194 Low-threshold laser with In—Ga—As—P heterostructure. Alferov, Z.I.; Gorelenok, A.T.; Kop'ev, P.S.; Mdivani, V.N.; Tibilov, V.K. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 481-482(Nov 1977).

The threshold properties of InP-InGaAsP-InP heterojunction lasers were studied. The double heterostructures were grown by liquid-phase epitaxy.

45195 Mode pulling in a neodymium garnet laser. Golyaev, Y.D.; Grushetskii, A.V.; Kaptsov, L.N.; Sokolov, V.A. (M. V. Lomonosov Moscow State University). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 507-508(Nov 1977).

An attempt is made to explain the observed nonlinearity of frequency pulling by the kramers-kronig relation.

45196 Multimode ring laser. Danileiko, M.V.; Danilov, N.K.; Kozubovskii, V.R.; Shpak, M.T. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 4, 436-440(Oct 1977).

An experimental investigation of the modes of a multimode ring laser is described. High-Q resonances are obtained which fix the symmetrical position of the modes with respect to the centers of the spectral components of the laser medium. The experimental data and the results of theoretical calculations are compared.

45197 Polarization of the active medium of a multimode gas laser with excitation modulation. Burnashev, M.N. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 4, 471-472(Oct 1977).

Equations are derived describing a gas laser with excitations modulation in the active element. Both the in phase component and the wave component are taken into account.(AIP)

45198 Spatial coherence of the emission of a rhodamine-6G water-solution laser in an unstable cavity with lamp pumping. Aristov, A.V.; Kozlovskii, D.A.; Staselko, D.I.; Strigun, V.E. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 4, 474-475(Oct 1977).

Methods of reducing the thermo-optical distortions that occur in pumping dye lasers are considered.(AIP)

45199 Laser cavity with low-reflectance output mirror and reduced radiation loading on the element. Sapelkin, N.V.; Spiridonov, V.V. *Sov. J. Opt. Technol. (Engl. Transl.);* **44**: No. 10, 622-624(Oct 1977).

It is shown to be possible to reduce the radiation loading on the "blind" mirror of a cavity through the use of an output mirror having a low reflection coefficient (10^{-2}—1%), no antireflection coatings and possessing a radiation strength close to the volume radiation strength of the glass.

45200 Effect of excitation conditions on the radial distribution of population inversion in the active element of a He—Ne laser. Leontev, V.G.; Ostapchenko, E.P. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 3, 321-325(Sep 1977).

The effect of the pressure of the mixture, the ratio of the components, and the pumping current on the radial distribution of the gain in narrow tubes of a He—Ne laser operating on the $3s_2$—$2p_4$ transition (λ=6328 A) is investigated. In calculating the gain the balance equation for the level populations under steady-state conditions and experimental values of the discharge plasma parameters are used.

45201 Nonlinear Zeeman effect in a ring gas laser. Sokolov, V.A.; Fradkin, E.E. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 3, 325-329(Sep 1977).

The effect of a constant (longitudinal) magnetic field on the frequency difference between the oppositely traveling waves of orthogonal circular polarizations in a ring gas laser is considered. It is shown that the nonlinear Zeeman effect depends very much on isotropic collisions and resonance radiation capture. Consideration of these interactions enables one to explain the experimentally observed dependence of the Zeeman splitting of frequencies in a He—Ne ring laser on their detuning with respect to the center of the gain line at different He and Ne pressures.

45202 Durable interference polarizers for lasers. Sokolova, R.S.; Serebryakov, V.A.; Razumovskaya, N.A.; Yashin, V.E. *Sov. J. Opt. Technol. (Engl. Transl.);* **44**: No. 9, 562-563(Sep 1977).

Interference polarizers for lasers, not requiring cementing in glass, have been developed employing layers of refractory oxides deposited from solutions. Their polarizing properties and radiation resistance to neodymium laser subnanosecond pulses have been investigated.

45203 Effect of line selection on the output of a CO laser. Konev, Y.B.; Kochetov, I.V.; Pevgov, V.G. (Physicotechnical Institute, Moscow). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 8, 297-298(Aug 1977).

The efficiency of a CO laser as a function of the degree to which the spectrum is thinned out is studied theoretically. A numerical solution is found for the system of balance equations for the populations of 50 vibrational states.(AIP)

45204 Laser action at 16 μ by optical pumping of CO_2 with an HF laser. Kuntsevich, B.F.; Stepanov, B.I.; Trushin, S.A.; Churakov, V.V. (Institute of Physics, Academy of Sciences of the Belorussian SSR, Minsk). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 8, 308-309(Aug 1977).

Calculations are presented on the threshold properties of a CO_2 laser that is optically pumped by the $P_1(7)$ line of a HF laser. The dependence on the CO_2 pressure is considered.(AIP)

45205 Single-frequency operation of a pulsed neodynmium-glass ring laser. Makogon, M.M.; Solodov, A.M. (Institute of Atmospheric Optics, Siberian Branch, Academy of Sciences of the USSR, Tomsk). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 8, 312-313(Aug 1977).

It is demonstrated that a dynamic isolator makes it possible to control the spectral-kinetic output characteristics of a travelling-wave laser.(AIP)

45206 Axial mode locking in a solid-state laser with a time-varying cavity. Kravtsov, N.V.; Sidorov, V.A.; Susov, A.M. (M. V. Lomonosov Moscow State Univeristy). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 7, 250-251(Jul 1977).

Experiments are reported using a laser cavity formed by plane and spherical mirrors in which the plane mirror executes sinusoidal oscillations. Mode locking in a YAG:ND^{3}+ laser is demonstrated.(AIP)

45207 Frequency selection in a helium—cadmium laser with transverse rf excitation. Dyatlov, M.K.; Kas'yan, V.G.; Levin, V.G. *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 7, 264(Jul 1977).

A novel quartz laser tube was employed to create cw lasing in a He-Cd system. The output power and noise level were among the properties investigated.(AIP)

45208 Periodic operation of a KrF excimer laser. Ishchenko, V.N.; Lisitsyn, V.N.; Razhev, A.M. (Institute of the Physics of Semiconductors, Siberian Branch, Academy of Sciences of the USSR, Novosibirsk). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 7, 281-282(Jul 1977).

The efficiency and output power of a KrF excimer laser are studied in order to determine the relative importance of "thermal" and "chemical" effects.(AIP)

45209 Atomic fluorine laser: spectral pressure dependence. Loree, T.R.; Sze, R.C. (Los Alamos Scientific Lab., CA). *Opt. Commun.;* **21**: No. 2, 255-257(May 1977).

Atomic fluorine was lased at pressures up to 30 psia in a double discharge laser with vigorous flashboard pre-ionization. The spectral output of the laser is a function of pressure, with low pressure favoring doublet transitions and high pressure inducing new laser transitions in the quartet manifold.

45210 Flash bulb. Mack, M.E.; Northam, D.B.C. (to Jersey Nuclear-Avco Isotopes, Inc., Bellevue, Wash. (USA)). German(FRG) Patent 2,633,550/A/. 31 Mar 1977. 27p. (In German).

To achieve highly reproducible light flashes to pulse a laser, the main pulsed discharge is stabilized by preionization of the gas, at a lower voltage. A cool inert gas is also circulated helically along the sides of the tube; this better restricts the discharge to a determined path.

45211 Optical emitter or amplifier for energy-rich radiation (Laser). Roess, D. (to Siemens A.G., Berlin (Germany, F.R.); Siemens A.G., Muenchen (Germany, F.R.)). German(FRG) Patent 1,919,821/B/. 10 Mar 1977. 4p. (In German).

The amplifying medium of a laser in the form of a hollow cylinder, with the flash and concentric mirror at one end. An extra flash is provided in the center of the cylinder. This shape of amplifying medium allows highly energetic pulses without local overheating of the medium.

45212 Prospects of the high power iodine laser. Hohla, K.; Brederlow, G.; Fill, E.; Volk, R.; Witte, K.J. (Max-Planck-Gesellschaft zur Foerderung der Wissenschaften e.V., Garching, Ger.). pp 97-113 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

The theory and operating parameters of the iodine laser are discussed. The technology for developing a high-power iodine laser for use in fusion reactions is assessed. (TFD)

45213 Terawatt iodine laser. Witte, K.; Brederlow, G.; Fill, E.; Hohla, K.; Volk, R. (Max-Planck-Gesellschaft zur Foerderung der Wissenschaften e.V., Garching, Ger.). pp 115-119 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

The high power iodine laser ASTERIX III is described. It is a single beam system designed to yield an output power in the 1 Terawatt range (energy about 1 kJ, pulse duration about or less than 1 ns). It will be used for plasma production with power densities on the target surface expected in the range between 10^{17} to 10^{18} W/cm^2.

45214 Recent developments in high power CO_2 laser mode-locking and pulse selection. Corkum, P.B.; Alcock, A.J.; James, D.J.; Andrews, K.J.; Leopold, K.E.; Rollin, D.F.; Samson, J.C. (National Research Council of Canada, Ottawa). pp 143-160 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

Injection mode-locking techniques have been applied to a wide range of CO_2 laser oscillators and power gains as high as 10^{12} were observed. Recent results obtained with uv preionized multiatmosphere and atmospheric pressure CO_2 lasers are reported and compared with the predictions of a numerical modelling study. In addition, the recent development of semiconductor reflection switching offers the possibility of selecting single pulses from a multigigawatt mode-locked oscillator while simultaneously providing the advantage of retro-pulse isolation. Single pulses in the 1 to 2 J range have been selected by this technique.

45215 Direct nuclear pumped lasers: status and potential applications. Miley, G.H. (Univ. of Illinois, Urbana). pp 181-228 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

Recent direct nuclear pumped laser (DNPL) research is reviewed with emphasis on recent experiments at the University of Illinois employing three gas mixtures (Ne—N_2, He—Ne—O_2, and He—Hg). Lasing has been obtained in the cases of N_2 and Hg, and gain has been observed in O_2. All three mixtures are discussed with particular attention to He—Hg where visible laser output on the 6150-A ion transition in Hg^+ has been achieved. Scaled-up versions of present experimental lasers are considered that potentially capitalize on the unique ability to pump large volumes of high-pressure gases using neutron-initiated nuclear reactions in ^3He or UF_6 mixtures. A multi-MJ laser based on existing fast-burst reactor technology appears feasible in the near term. More advanced designs offer even larger energies, but require considerable development. Use of a DNPL to provide improved energy recirculation in a laser-fusion system appears attractive provided appropriate energy storage and pulse shaping techniques can be developed. Possible approaches using either a flowing transfer-type DNPL or a deuterium-rich pellet with a neutron propagation blanket.

45216 Progress on x-ray laser research. Jaegle, P.; Jamelot, G.; Carillon, A.; Sureau, A. (Paris Univ., Orsay). pp 229-248 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

Research progress on the possible methods being investigated for achieving x-ray lasers is presented. The dense plasmas produced by laser impact is considered to be the most likely and promising approach. (TFD)

45217 On the feasibility of grasers. Baldwin, G.C. (Rensselaer Polytechnic Inst., Troy, NY). pp 249-257 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

The cross section at resonance for induced gamma ray transitions in nuclear isomers would be adequate for gain if population inversion could be reconciled with recoilless (Moessbauer) emission; the overriding consideration is inhomogeneous broadening from hyperfine interactions and isomer shifts. Feasibility of a graser in which the crystal is pumped by intense neutron burst depends upon the relative rates of isomer formation and development of lattice damage during the time required for neutron moderation and wave incubation; a major uncertainty is the isomer ratio. It appears feasible to isolate inverted populations of isomer in quantity adequate for preparing a graser by assembly after irradiation; the limiting factor will be the extent to which the recoilless line breadth can be controlled by as-yet-undemonstrated techniques. Decision on feasibility and identification of transitions suitable for either type of graser await better understanding of these factors.

45218 Kinetics of stimulated emission in neutron-pumped nuclear laser systems. Baldwin, G.C. (Los Alamos Scientific Lab., NM). pp 259-266 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

Plane wave solution of kinetic equations for a Moessbauer transition graser, pumped by an instantaneous neutron burst, shows low group velocity and reduced nonexponential amplification prolonged by superradiance when account is taken of time-dependence ("inertia") in the resonance cross section and of finite neutron moderation time and indicates that directly pumped grasers, assuming that radiation damage and isomer ratios do not preclude their functioning, should employ resonance capture and recoilless transitions between excited states.

45219 Nuclear techniques for directed emission and swtiched operation of grasers. Wilson, G.V.H.; Hora, H.; Chaplin, D.H.; Foster, H.R.; George, E.P. (Univ. of New South Wales, Sydney). pp 267-282 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

The high frequency limitation of gamma ray lasers (grasers), the laser condition for feasible densities and the use of polarized nuclei in grasers is discussed. It is shown that, with polarized nuclei, directed emission and switched graser control are feasible. Experimental techniques and results for both resonant and nonresonant notations of the γ-radiation distributions from polarized radioactive nuclei are presented.

45220 Possibility of grasers using nuclear excitation by electron transition. Okamoto, K. (Univ. of New South Wales, Kensington, Australia). pp 283-304 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

It was recently shown that some transitions of atomic electrons can excite the nuclear state, provided that certain conditions are satisfied. This mechanism, called NEET (abbreviation of nuclear excitation by electron transition), may possibly be used for a graser. Although the NEET probability is much smaller than the atomic excitation that gives rise to NEET, the life-time of the nuclear state is much longer than the corresponding atomic state, and hence is convenient for pumping. Numerical examples show, however, that the necessary pumping power is much higher than the presently available one, but it can be shown that as far as the excitation rate of

the nuclear state is concerned, NEET is superior to other methods, such as direct atomic or nuclear excitation. Future progress of this field may solve the problem of the pumping power, in which case NEET may be used for a graser.

HEAT TRANSFER AND FLUID FLOW

REFER ALSO TO CITATION(S) 44689, 44820, 44902, 45231

45221 Economic optimization of counter-flow heat exchanges. Korpela, T. *Brennst.-Waerme-Kraft;* **29**: No. 8, 326-330(Aug 1977). (In German).

The economical optimal dimensioning of a counter-flow heat exchanger is investigated for the case that the difference of the inlet temperatures and the heat capacity flow on one side remain constant. It is furthermore assumed that the transmitted heat flow, the heat conduction and the heat capacity flow on one side are linked with linear cost functions, and that the minimum has to be determined for their total costs. The optimization is analytically possible with various boundary conditions, although the solution of a transcendental equation with one variable has to be found. The recuperation degrees (or the recuperation deficits) of the heat transmission prove to be useful mathematical quantities, and their optimal values may be expressed with the help of a dimensionsless variable which is dependent on two cost factors and on the difference of the inlet temperatures. These relations are shown for the solution of various optimization requirements, both analytically and in form of diagrams.

MATERIALS TESTING

REFER ALSO TO CITATION(S) 44260, 44295

45222 (BN-SA—311) **Electromagnetic methods for inspection of ferrous tubing.** Crowe, J.C. (Battelle Pacific Northwest Labs., Richland, Wash. (USA)). 24 Apr 1974. Contract EY-76-C-06-1830. 20p. (CONF-741074—2). Dep. NTIS, MF A01.

From Fall conference of American Society for Nondestructive Testing; Detroit, MI, USA (21 Oct 1974).

Portions of document are illegible.

Electromagnetic-acoustic (EMAC) techniques have been applied to the nondestructive inspection of ferromagnetic tubing. EMAC combines the advantages of noncontract electromagnetic inspection with the flaw detection capabilities of ultrasonic inspection techniques. Laboratory studies have demonstrated the capabilities of the method for detecting cracks, pits, and wall thinning in carbon steel boiler tubing. Results of the studies demonstrate the feasibility of using internal EMAC probes for inspection of installed tubing. Multiparameter eddy current techniques show promise for detecting wall thinning in ferromagnetic tubing. A two frequency multiparameter eddy current system was shown to provide the parameter separation capability necessary for the detection of wall thinning in the presence of shallow internal pitting and surface scale. Machined steps in the wall of carbon steel tubing were detected with the multiparameter system. An internal magnetization probe was applied to ferromagnetic tubing. The internal magnetization probe concept may be used to produce increased penetration of eddy current signals, to reduce magnetic permeability variations in ferrous tubing, and can be incorporated into EMAC inspection probes. Further development of one or more of these electromagnetic inspection techniques may provide a means for field inspection of installed ferrous tubing.

45223 (NUREG/CR—0135) **Improved ultrasonic nondestructive testing of pressure vessels. Progress report, October 1, 1976—September 30, 1977.** Frederick, J.R.; Vandenbroek, C.J.J.; Fairchild, R.C.; Elzinga, M.B. (Michigan Univ., Ann Arbor (USA). Dept. of Mechanical Engineering). May 1978. 157p. NTIS $8.00.

Test results and methods development for a synthetic aperture focusing technique for ultrasonic pulse-echo flaw evaluation are described. Verification of the system's flaw-imaging capability is presented in the form of test results from several different test samples. The development of improved data processing and display techniques are also described.

45224 (UCRL—52431) **Optical inspection of small-diameter deep bores using rod optics with low-light television and still photography.** Lord, D.E.; Petrini, R.R.; Carter, G.W.; Clark, T.D. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 22 Feb 1978. Contract W-7405-ENG-48. 14p. Dep. NTIS, PC A02/MF A01.

Modification of a commercially available rod optic system to allow internal corrosion inspection of a 2-in.-deep, 1/16-in-dia drill hole in stainless steel, and provide 90-deg (normal) views of the internal bore surface is described. To help detect corrosion and record its presence for more study, the rod optic was coupled to a low-light color video system and results were then compared to both color and black-and-white still photographs. The modified rod optic coupled to the low-light color video system is currently the best means of determining corrosion in small, deep bores.

VACUUM ENGINEERING

45225 Pressure measurements in a cryogenic environment. Edwards, D. Jr.; Limon, P. (Brookhaven National Laboratory, Upton, New York 11973). *J. Vac. Sci. Technol.;* **15**: No. 3, 1186-1188(May 1978).

A technique is presented which allows the measurement of He and H_2 pressures in a cold system ($\sim$4 K) with instrumentation at room temperature. It is applied to vacuum measurements of a section of a beam tube to be used in a proton accelerator application. The primary result is that with the beam tube at 4.7 K the helium pressure is less than $10^{-}11$ Torr and the H_2 pressure is negligible.

45226 Turbomolecular pump vacuum system for the Princeton Large Torus. Dylla, H.F. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08540). *J. Vac. Sci. Technol.;* **15**: No. 2, 734-740(Mar 1978).

A turbomolecular pump vacuum system has been designed and installed on the Princeton Large Torus (PLT). Four vertical shaft, oil-bearing, 1500-l/s turbomolecular pumps have been interfaced to the 6400-l PLT vacuum vessel to provide a net pumping speed of 3000 l/s for H_2. The particular requirements and problems of tokamak vacuum systems are enumerated. A vacuum control system is described which protects the vacuum vessel from contamination and protects the turbomolecular pumps from damage under a variety of possible failure modes. The performance of the vacuum system is presented in terms of pumping speed mesurements and residual gas behavior.

45227 Nitrogen pressure in a vacuum system. Edwards, D. Jr. (Brookhaven National Laboratory, Upton, New York 11973). *J. Vac. Sci. Technol.;* **15**: No. 2, 755-757(Mar 1978).

Since the N_2 outgassing rate from walls of a vacuum system is generally recognized to be very small, the presence of an N_2 pressure in the system is a useful indication of the presence of real leaks to the atmosphere. A technique of thermal desorption mass spectrometry is introduced which allows the N_2 pressure in the background gas of a baked system to be separated from a CH_4 background to a minimum level of N_2 detectability of $\sim$1% of the CO background pressure. In typical baked systems (of which an example is given), it is possible to determine the sum of all real N_2 leaks from atmosphere at a level of $\sim 10^{-}11$ Torr l/s. This feature makes the technique ideally suited to large complex systems since the leak rate can be evaluated before detailed leak-finding procedures are initiated.

ELECTRONIC CIRCUITS AND DEVICES

REFER ALSO TO CITATION(S) 45267, 45276

45228 (BDX—613-1955(Rev.)) **N-methyl-2-pyrrolidone as a stripper for plastic potting compounds.** Steele, J.W. (Bendix Corp., Kansas City, Mo. (USA)). Apr 1978. Contract EY-76-C-04-0613. 21p. Dep. NTIS, PC A02/MF A01.

Investigations have shown N-methyl-2-pyrrolidone to be a superior solvent for removal of several thermoset plastics used in potting electronic assemblies. The technique has proven to be useful for salvaging components from potted assemblies and for failure analysis postmortem of delicate electronic assemblies.

45229 (SAND—77-2031) **LCL: a compiler and language for logical mask checking.** Stauffer, J.D. (Sandia Labs., Albuquerque, N.Mex. (USA)). Mar 1978. Contract EY-76-C-04-0789. 38p. Dep. NTIS, PC A03/MF A01.

Portions of document are illegible.

A compiler code was developed which provides a convenient interface between the engineer/designer and the LOGMASC code. This code is used for checking plot files for photographic masks used in the fabrication of integrated circuits. The language described is easy to use and contains a powerful construct for parsing compound logical expressions written in an extended Polish notation designed for use in logic circuit design. 6 figures, 2 tables.

COMBUSTION SYSTEMS

REFER ALSO TO CITATION(S) 44054, 44131, 44133

45230 (CONF-771015—17) **Catalytic combustion: a look back, a look forward.** Pfefferle, W.C. (Pfefferle (William C.), Consultant, Middletown, N.J. (USA)). 1977. 19p. William C. Pfefferle, Middletown, NJ.

From Fall meeting of the Western States Section of the Combustion Institute; Palo Alto, CA, USA (17 Oct 1977).

The catalytic combustor, developed in its present form at the turn of the decade, was regarded in the beginning as impractical for most combustion applications. Catalytic oxidation reactors already being used to power nitric acid plant gas turbines were large and inefficient being mass transfer limited. Further, the catalysts used were not stable much above 800°C. It was also felt by some that the tail gas clean-up approach was simpler. The impetus for development of the catalytic combustor came from an analysis of thermal reactor and other homogeneous oxidation data. Such data combined with catalytic reaction theory for mass transfer limited reactions led to the basic concept for the catalytic combustor. The theoretical concepts account for the important operating characteristics of the combustor. Although catalyst requirements are stringent, it is interesting to note that the original work was with off-the-shelf catalysts. Present day catalysts stable to 1500°C have been reported. New higher temperature catalyst supports offer the potential for catalysts capable of operating above 1650°C. Near term applications to gas turbines and furnaces appear feasible.

45231 (FE—1787-8) **Modeling of a fluidized bed combustor with immersed tubes. Quarterly report, March—August 1977.** Saxena, S.C.; Grewal, N.S. (Illinois Univ., Chicago (USA). Dept. of Energy Engineering). Sep 1977. Contract EX-76-C-01-1787. 39p. Dep. NTIS, PC A03/MF A01.

Experiments have been carried out to measure the total heat transfer coefficient between a 12.7 mm diameter copper tube immersed in a fluidized bed of silicon carbide, alumina, sand and dolomite of different sizes. The minimum fluidization velocities have also been determined. An invited review article dealing with the existing world literature on heat transfer between a fluidized bed and immersed tubes has been finalized.

45232 Determination of the efficiency of the slow-burning stoves for solid fuels. Pochcial, J. *Brennst.-Waerme-Kraft;* **29**: No. 12, 474-479(Dec 1977). (In German).

The article deals with the problems of the efficiency determination of slow-burning stoves for solid fuels which are causing unavoidable measuring errors, when obtaining the efficiency as a function of the sum losses, according to the present measuring method. A new measuring method presented for obtaining the full heat balance, avoids these measuring errors, by taking the useful heat into consideration. The test rig is described, measuring results presented and conclusions provided in relation to DIN 18890, especially on burning open-burning coal.

45233 Gas-heated boiler plants with an efficiency of more than 100%. Kremer, R. *Haustech. Rundsch.;* **75**: No. 7, 332-333(1976). (In German).

The raising of boiler efficienc beyond 88 to 90% by making use of the Recitherm 'useful heat' devices is described, and the operation of these devices is discussed. Possible uses include; heating systems requiring a lot of service water, pool water heating in indoor and outdoor swimming pools, floor heating, horticultural soil heating, heating systems for air conditioning, and heat recovery. A corrosion-proof stack installation not sensitive to dew point is required. Profitability is demonstrated down to the minimum boiler output of 100 kW and the amortization period is discussed.

UNDERGROUND ENGINEERING

REFER ALSO TO CITATION(S) 44095, 44112

MARINE ENGINEERING

45234 Measurement of elastic strain in granular material. Boyce, J.R.; Brown, S.F. *Geotechnique;* **26**: No. 4, 637-638(Dec 1976).

During tests associated with problems of earthquake effects, pavement design and offshore structure foundations, small strains need to be measured under conditions of rapid repeated loading. Under these conditions conventional manual techniques are not feasible and electrical transducers associated with direct on sample measurement provide the best solution.

POLLUTION CONTROL EQUIPMENT

REFER ALSO TO CITATION(S) 44626

45235 (PB—266103) **Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series.** Van Osdell, D. (comp.). (Research Triangle Inst., Research Triangle Park, N.C. (USA)). Feb 1977. 343p. (CONF-751265—; EPA—600/2-77-060). NTIS.

From Seminar on in-stack particle sizing for particulate control device evaluation; Research Triangle Park, NC, USA (3 Dec 1975).

The proceedings document discussions during an EPA/IERL-RTP-sponsored seminar on In-stack Particle Sizing for Particulate Control Device Evaluation are presented. The seminar, organized by IERL-RTP's Process Measurements Branch, was held at IERL-RTP in North Carolina on December 3 and 4, 1975. The first day's discussion was on the use of cascade impactors, including calibration, field use experience, weighing techniques, and elemental analysis of impactor samples. Sizing techniques other than with cascade impactors were discussed on the second day, with special emphasis on diffusion batteries. The proceedings consist of edited versions of the seminar speakers' transcripts. Some were edited into technical paper format; others remain in conversational tone. Visual aids presented by the speakers are included.

45236 Method for removing hydrogen sulfide from sulfur-bearing industrial gases with clause-type reactors. Singleton, A.H.; Homberg, O.A.; Sheldrake, C.W. (to Bethlehem Steel Corp.). US Patent 4,085,199. 18 Apr 1978. Filed date 8 Jun 1976. 18p.

Integrating an absorption-desorption step, a Claus plant, and a catalytic hydrogen reactor in a recycle loop provides a gas-desulfurization plant that operates at a substantially zero emission level. Hydrogen sulfide is removed from industrial gas streams by absorption-desorption in a liquid absorbent. The resulting foul gas is then reacted with sulfur dioxide in a Claus reaction, i.e., the reaction of hydrogen sulfide with sulfur dioxide to form elemental sulfur and water. The tail gas from this Claus reaction is then passed through a catalytic hydrogenation reactor together with a supply of hydrogen to reduce the sulfur and sulfur compounds to hydrogen sulfide. The now reduced tail gas is then recycled back to the industrial gas, upstream of the absorption-desorption step.

45237 Supercompact jet filters in cyclone dimensions with optimum single-sleeve rinsing systems set new standards. Flatt, W. *Staub-Reinhalt. Luft;* **37**: No. 11, 412-416(Nov 1977). (In German).

When comparing with hitherto known sleeve filters, double up to fourfold air-to-cloth ratios are possible with Buehler airjet and ring-jet filters of the circular total separator range and the rectangular unit-composed design due to the geometrically optimized flow of the single sleeve rinsing system. Certified operation data, measured in several plants after about 8,000 service hours give evidence of the high performance of this new filter generation. The special design allows replacement of large cyclones on roofs by sleeve filters with the aid of simple mobile cranes and without particular structural alterations. By this means, new practical possibilities are available to adapt existing plants to new environmental regulations with a minimum of expenses.

45238 Installations and methods for dust control and dust samplers. *Glueckauf;* **113**: No. 21, 1051-1052(Nov 1977). (In German).

45239 Large-volume sampler for submicroscopic aerosol particles. Mohrmann, H.; Biermann, A. *Staub-Reinhalt. Luft;* **37**: No. 11, 431-433(Nov 1977). (In German).

A condensation technique was developed and together with a wet cyclone tested in order to sample submicroscopic airborne particles in the range of high-volume samplers. Water soluble and hydrophilic particles ranging down to approximately 0.07 μm diameter were recovered by the cyclone quantitatively. Losses of insoluble particles having strong superficial forces due to wall impact in the highly turbulent flow were inevitable. But in this case the method was successful also, because at least 60 to 80% of the particles otherwise passing through the cyclone were sampled.

45240 Performance of a pulse jet filter at high filtration velocity. III. Penetration by fault processes. Leith, D.; First, M.W. *J. Water Pollut. Control Fed.;* **27**: No. 8, 754-758(Aug 1977).

Performance data for fabric filters using either woven or felt bags can be better understood when fault processes such as pinhole by-pass and seepage are considered. Penetration straight through the dust cake and fabric may not be important by comparison. Observed trends of increased penetration with increased filtration velocity, constant or slightly increased penetration with increasing particle diameter, and constant penetration with additional dust loading can be explained by fault processes. The pulse-jet experimental work

described here, done over many filtration and cleaning cycles, shows that penetration increases substantially with increasing filtration velocity and that this increase is due entirely to seepage.

45241 Electrically induced waste air combustion. Applications and advantages of the new process. Ackermann, F.H. *Metalloberflaeche-Angew. Elektrochem.;* **31**: No. 5, 190-192(May 1977). (In German).

A method of thermal-oxidative waste air purification is described in which electromagnetic waves, instead of the usual combustion of auxiliary fuels, is used to heat the waste air up to oxidation temperatures. As nitrogen absorbs wave energy less well than oxygen or hydrocarbons, the reaction partners have already reached the reaction temperature when the mean temperature of the mixture is far lower. The following advantages over conventional thermal oxidation processes are listed: complete combustion of noxious substances at low temperatures, low NO/sub x/ formation, low carbon monoxide concentration in the purified gas, frequently no need for ventilation, therefore lower energy costs, and exact and fast control of the electric radiators. Three examples of application are described.

POWER CYCLES

BRAYTON

45242 (AD-A—047262) **Convection in the closed Brayton cycle. Annual summary report No. 3, 1 April 1976—31 March 1977.** Picket, P.E.; McEligot, D.M.; Taylor, M.F. (Arizona Univ., Tucson (USA). Engineering Experiment Station). 1 Apr 1977. Contract N00014-75-C-0694. 71p. NTIS PC A04/MF A01.

To correspond to conditions expected in components in the closed Brayton cycle, analyses and experiments were conducted for forced convective heat transfer to gases and gas mixtures flowing in ducts. The range of interest was 0.2 = or > than Pr = or > than 0.7, representing mixtures of inert gases. Numerical analyses predicted that existing scaling laws for gases would not represent the Prandtl number dependence adequately for laminar or turbulent flow. Measurements with an argon-helium mixture confirmed the trends of the predictions for turbulent flow in circular tubes. The wall turbulent Prandtl number was determined for 0.4 = or > than Pr = or > than 0.5. (Author)

STIRLING

45243 Thermodynamic engine used as a refrigerator or as a heat engine. Knoeoes, S. (to AGA AB, Lidingoe (Sweden)). German(FRG) Patent 2,109,891/C/. 10 Apr 1975. 23p. (In German).

The invention concerns a heat engine which, in comparison to the well-known engines of this type (e.g. Stirling engines) has a higher efficiency, a lower weight, and a simpler construction, and only causes slight pollution of the environment. The equipment consists of one or more reciprocating pistons. The working gas flows from a container via a regenerator and a heat exchanger to the primary chamber during the forward stroke. This process is controlled by valves. When running on open cycle, the working gas is taken from the atmosphere. A transfer valve takes part of the working medium into the secondary chamber during the working cycle, so that the volumes of the primary and secondary chamber change in nearly reverse proportions, but a pressure difference remains between the two chambers. On the next forward stroke, the working gas in the secondary chamber is compressed to the pressure in the container, or on open cycle is released to the atmosphere via an outlet valve. Variations, arrangement and method of operation of the individual elements for use as heat engines or refrigerators are shown in many claims, examples, and drawings.

OTHER

REFER ALSO TO CITATION(S) 44609

45244 Method of recovering energy by means of a cyclic thermodynamic process. von Platen, B. (to Fondation Cum Plate). US Patent 4,084,408. 18 Apr 1978. Filed date 9 Feb 1976. 22p.

A method of recovering energy by means of a cyclic thermodynamic process is induced by means of a medium comprising at least two substances or groups of substances, one of which substances is separated from the other at a point defining a first thermodynamic parameter of the medium and combined with the other one of said substances at a second point defining second thermodynamic parameter of the medium while a differential in total pressure of the medium is maintained between the two points. The separation and combination of the two substances are induced by diffusion whereby one of the substances or groups of substances is diffused out of the other one of the substances or groups of substances at the first point and diffused into the other substances at the second point. The method contemplates particularly the recovery of energy from a heat reservoir of lower temperature by means of a cyclic thermodynamic process and has particular application to steam engines, refrigeration plants and heat pumps for the purpose of increasing the efficiency thereof and is based upon the concept of combining two processes one of which produces work and the other of which absorbs work.

PARTICLE ACCELERATORS

45245 Observation of undulating radiation with the "Pakhra" synchrotron. Alferov, D.F.; Bashmakov, Y.A.; Belovintsev, K.A.; Bessonov, E.G.; Cherenkov, P.A. (P. N. Lebedev Physics Institute, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 385-388(5 Oct 1977).

An experiment aimed at observing undulating radiation with the "Pakhra" synchrotron in the visible region of the spectrum is described.

DESIGN, DEVELOPMENT, AND OPERATION

45246 (AECL—5903) **Future of high intensity accelerators in nuclear energy.** Schriber, S.O.; Fraser, J.S.; Tunnicliffe, P.R. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Aug 1977. 32p. (CONF-770709—22). Dep. NTIS (US Sales Only), PC A03/MF A01.

From 10. international conference on high energy accelerators; Serpukhov, USSR (11 Jul 1977).

A possible application for a high mean current, intermediate-energy proton linear accelerator is the "electrical breeding" of fuel for nuclear electrical power stations. The possible role of the spallation breeder in the context of a Canadian nuclear power economy and its relationship to nuclear fuel resources are discussed. The production of fissile material using the spallation process in a target containing actinide elements appears desirable and feasible from engineering and economic considerations. Current development work in Canada and some of the outstanding problems are discussed.

BEAM DYNAMICS, FIELD CALCULATIONS, AND ION OPTICS

45247 Fast neutralization of ion beams in the presence of transverse magnetic fields. Poukey, J.W.; Humphries, S. Jr. (Sandia Laboratories, Albuquerque, New Mexico 87185). *Appl. Phys. Lett.;* **33**: No. 2, 122-124(15 Jul 1978).

A crucial problem in pulsed linear ion accelerators is the time-dependent space-charge neutralization of the ion beam by electrons from the walls. Analytic estimates and numerical simulation are used to discuss this problem, and it is found that in the presence of a magnetic field transverse (but not normal) to the ion flow, there is nearly complete neutralization on the scale of the ion beam rise time.

45248 Self-magnetic insulation in vacuum for coaxial geometry. Shope, S.; Poukey, J.W.; Bergeron, K.D.; McDaniel, D.H.; Toepfer, A.J.; VanDevender, J.P. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 7, 3675-3678(Jul 1978).

Magnetic insulation obtained by employing the magnetic field of the line current in coaxial vacuum-transmission lines is studied in experiments on two different relativistic electron-beam accelerators, spanning the voltage range 0.4—10 MV. Effective magnetic insulation at fields up to 1.3 MV/cm is demonstrated. The self-limiting impedance is measured and compared to a number of theories for magnetic insulation and it is found that none of the "standard" theories successfully describes the data. However, computer simulations using a self-consistent two-dimensional particle code give good agreement with the experimental data, as does a proposed modification of the parapotential flow model.

AUXILIARIES AND COMPONENTS

45249 Resistive phase of a high-voltage water spark. VanDevender, J.P. (Pulsed Power Research and Technology Division 5245, Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 5, 2616-2620(May 1978).

The resistive phase of self-breaking water-dielectric spark gaps in a high-current relativistic electron-beam accelerator is investigated experimentally. For gaps that withstand voltages V< or =1.8 MV and mean electric fields between 2 x 10^7 and 5 x 10^7 V/m,

both the current rise time and the energy dissipated in the discharge are adequately described by the semiempirical relations of Martin. In contrast to the results reported in lower-energy experiments, no evidence was found of a slowly varying resistive phase with a gap resistance comparable to the circuit impedance after t=2.5tau/sub r/ . Approximately 8 +- 3% of the energy dissipated in the gap is coupled into a shock wave generated by the discharge. Light emission from the arc channels indicated that the light was strongly filtered by the highly excited water surrounding the channel, and the light emission cannot be analyzed to determine the plasma properties of the arc channel unambiguously.

ION SOURCES

45250 Effect of preacceleration voltage upon ion-beam divergence. Whealton, J.H.; Grisham, L.R.; Tsai, C.C.; Stirling, W.L. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Appl. Phys.;* **49**: No. 6, 3091-3101(Jun 1978).

The effect of an insulator coating on the plasma electrode of a duoPIGatron ion source on ion-beam optics was examined theoretically and experimentally. The effect of a preacceleration potential, applied between the insulated electrode and the target cathode of the source plasma, on ion optics was also examined. A principal result is that this electrode arrangement with precel gives a much lower beam divergence than the same arrangement without precel. Detailed comparisons between the data and calculations are presented.

STORAGE RINGS

45251 Glow discharge processing versus bakeout for aluminum storage ring vacuum chambers. Dean, N.R.; Hoyt, E.W.; Palrang, M.T.; Walker, B.G. (Stanford Linear Accelerator Center, Stanford University, Stanford California 94305). *J. Vac. Sci. Technol.;* **15**: No. 2, 758-760(Mar 1978).

Experiments were carried out on laboratory and prototype scale systems in order to establish the feasibility of argon discharge processing the PEP storage ring aluminum vacuum chambers. Electron-induced desorption rates showed significant reductions following bakeout and/or argon glow discharge treatment ($>10^{19}$ ions $cm^{-}1$). Data are presented and discussed in relation to advantages and problems associated with: water removal, argon trapping and subsequent release, electron energy dependence, discharge distribution, and surface plasma chemical effects.

INSTRUMENTATION

45252 High resolution ac calorimeter for organic liquids. Smaardyk, J.E.; Mochel, J.M. (Department of Physics and Materials Research Laboratory, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801). *Rev. Sci. Instrum.;* **49**: No. 7, 988-993(Jul 1978).

A calorimeter has been developed for organic liquids which utilizes the ac heat capacity technique. It can measure heat capacity changes of 1 part in 10^4 with a temperature resolution better than 1 mK from room temperature to 200°C. This calorimeter has been used to study the smectic A to nematic phase transition in a series of homologous liquid crystals.

RADIATION INSTRUMENTATION

45253 Imaging characteristics of an axisymmetric, grazing incidence x-ray microscope designed for laser fusion research. Boyle, M.J.; Ahlstrom, H.G. (Lawrence Livermore Laboratory, Livermore, California 94550). *Rev. Sci. Instrum.;* **49**: No. 6, 746-751(Jun 1978).

We report herein the first demonstration of the x-ray imaging characteristics of an axisymmetric x-ray microscope designed for laser fusion diagnostics. The design, fabrication, and evaluation of a grazing incidence hyperboloid/ellipsoid x-ray mirror pair are discussed. Initial data relating the measured mirror surface profiles, the estimated surface roughness, and mechanical alignment of the x-ray mirror pair to the observed spatial resolution are presented. A revised fabrication approach, utilizing a single point diamond turning feedback technique and resulting in improved resolution, is also discussed.

GENERAL DETECTORS AND MONITORS

REFER ALSO TO CITATION(S) 44623, 44697, 45265, 45379, 45382, 45383, 45387, 45388, 45389, 45390

45254 (LBL—7205) **Two detector MWPC position camera with honeycomb lead converters for medical imaging: performance and developments.** Perez-Mendez, V.; Lim, C.B.; Ortendahl, D.; Semper, R.; Cheng, A.; Chu, D.; Hattner, R.; Kaufman, L.; Price, D.C. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Feb 1978. Contract W-7405-ENG-48. 23p. (CONF-780235—1). Dep. NTIS, PC A02/MF A01.

From Wire chamber conference; Vienna, Austria (14 Feb 1978).

A MWPC camera for Nuclear Medicine imaging with positron emitting isotopes has been built. The two planar detectors are converter coupled MWPC with sensitive area 48 x 48 cm^2 placed 50 cm apart with clear space in between for the patient. The effective sensitivity of 5.8% for each detector with a spatial resolution of 7 mm FWHM on the image plane is achieved by use of honeycomb lead-on-plastic converters. Present performance in imaging test objects and in clinical applications is described, using various computer 3D reconstruction algorithms. Developments in progress include the use of small diameter lead oxide glass tube converters; techniques to eliminate multiple scatter events and improve the point response function; and electronics to provide accidental event subtraction.

45255 Characteristic x-ray spectra of sodium and magnesium measured at room temperature using mercuric iodide detectors. Dabrowski, A.J.; Huth, G.C.; Singh, M.; Economou, T.E.; Turkevich, A.L. (University of Southern California, Medical Imaging Science Group, 4676 Admiralty Way, Marina del Rey, California 90291). *Appl. Phys. Lett.;* **33**: No. 2, 211-213(15 Jul 1978).

Mercuric iodide detectors, operating at room temperature with the FET of the first stage of amplification cooled with a two-stage Peltier element, have been used to detect low-energy x rays from light elements excited by 2.0- and 6.1-MeV α particles. X-ray lines from Na (1.04 keV) and Mg (1.25 keV) have been seen for the first time with room-temperature energy-dispersive detectors. A resolution of 390 eV at 1.25 keV was obtained. Further improvement of the resolution is believed to be achievable. However, even the present characteristics are adequate for many applications in x-ray fluorescence and elemental analysis. Several such possible applications are suggested.

45256 Pulse-shape discrimination of high-energy neutrons and gamma rays in NaI(Tl). Share, G.H.; Kurfess, J.D.; Theus, R.B. (Naval Research Lab., Washington, D.C. (USA)). *Nucl. Instrum. Methods;* **148**: No. 3, 531-533(1 Feb 1978).

Pulse-shape discrimination can be used to separate neutron and gamma-ray interactions depositing energies up to in excess of 50 MeV in NaI(Tl) crystals. The secondary alpha particles, deuterons and protons produced in the neutron interactions are also resolvable.

45257 Electroradiographic device. Peschmann, K. (to U.S. Philips Corp.). US Patent 4,071,763. 31 Jan 1978. Priority date 28 Jun 1975, German, Federal Republic of (F.R. Germany). 4p.

Xonics chambers can normally be used only with comparatively low electrode voltages in the Townsend-plateau region of the discharge where no charge carrier multiplication occurs. The sensitivity is then comparatively low. The sensitivity can be increased by increasing the electrode voltage, but this gives rise to a high electrode voltage for a reasonable charge carrier multiplication. According to the invention a gas is added whose ionization energy is smaller than the energy of the lowest metastable levels of the rare gas in the chamber. The charge carrier multiplication, and hence the sensitivity is thus improved without the electrode voltage being substantially increased. For example, when 0.2% by volume trimethylamine is added, an electrode voltage of 13 kV already suffices.

45258 Optical properties of the entrance windows of photomultipliers. Reznikov, I.V. *Sov. J. Opt. Technol. (Engl. Transl.);* **44**: No. 10, 631-632(Oct 1977).

The absorption spectra of some PMT window samples have been investigated in the interval from $\lambda=220$ nm to $\lambda=5$ μm. Prolonged illumination is shown to have an effect on the absorption spectrum of the entrance windows, and this must be taken into account during the detection of ultraweak light signals at the one-photon level.

45259 Nuclear radiation measuring method and apparatus having blanking time inversely related to count rate. Luitwieler, S.H. Jr. (to Beckman Instruments, Inc.). US Patent 4,049,966. 20 Sep 1977. Filed date 2 Jul 1976. 8p.

A method and apparatus are described for inhibiting measurement of nuclear radiation in a scintillation counter during periods of excessive background radioactivity produced, for example, by cosmic energy surges impinging on the scintillation counter. The count rate of a radioactive source or sample being measured is monitored and detector means are provided for detecting the occurrence of an energy surge exceeding a predetermined energy level. When a surge is detected, inhibit means inhibits counting for a time period which varies inversely with the count rate.

45260 Halftone display, particularly for a high resolution radioactivity distribution detection system. Grenier, R.P. (to Baird-Atomic, Inc.). US Patent 4,044,332. 23 Aug 1977. Filed date 9 Jun 1975. 10p.

A device is described for presenting a halftone pictorial presentation composed of dot picture elements by selectively controlling the number of dot picture elements per unit area at locations on a display. In a high resolution radioactivity distribution detection system, the number of detected radioactive elements at XY locations of an array of sensing devices are fed to a computer and stored at corresponding address locations. The number of radioactive events detected at each address location is normalized into Gray scale coded signals as a function of the greatest number of radioactive events detected at any one address location. The normalized Gray scale coded signals are applied to a display for controlling the number of dot picture elements per unit area presented at corresponding XY locations on the display. The number of radioactive events detected at XY locations of the array are presented on the display as a halftone pictorial representation; the greatest number of picture dot elements per unit are being presented as a brighter image.

45261 Gamma compensated, self powered neutron detector. Brown, D.P. (to Energy Research and Development Administration). US Patent 4,008,399. 15 Feb 1977. Filed date 13 Jun 1975. 4p. PAT-APPL-586,698.

An improved, self-powered, gamma compensated, neutron detector is described having two electrically conductive concentric cylindrical electrodes and a central rod emitter formed from a material which emits beta particles when bombarded by neutrons. The outer electrode and emitter are maintained at a common potential and the neutron representative current is furnished at the inner cylindrical electrode which serves as a collector. The two concentric cylindrical electrodes are designed to exhibit substantially equal electron emission induced by Compton scattering under neutron bombardment to supply the desired gamma compensation.

RADIATION DOSEMETERS

REFER ALSO TO CITATION(S) 45827

NUCLEAR SPECTROSCOPIC INSTRUMENTATION

45262 Relativistic effects in the calibration of electrostatic electron analyzers. I. Toroidal analyzers. Keski Rahkonen, O. (Helsinki University of Technology, Espoo (Finland). Laboratory of Physics); Krause, M.O. (Oak Ridge National Lab., Tenn. (USA)). *J. Electron Spectrosc. Relat. Phenom.;* **13**: No. 2, 107-112(Feb 1978).

Relativistic correction terms up to the second order are derived for the kinetic energy of an electron travelling along the circular central trajectory of a toroidal analyzer. Furthermore, a practical energy calibration equation of the spherical sector plate analyzer is written for the variable-plate-voltage recording mode. Accurate measurements with a spherical analyzer performed using kinetic energies from 600 to 2100 eV are in good agreement with this theory showing our approximation (neglect of fringing fields, and source and detector geometry) is realistic enough for actual calibration purposes.

45263 Health. The risks assessment. van der Donckt. *Rev. Phys. Appl.;* **32**: No. 9, 133-137(1976). (In French).

The article is a critical review of the work group VI "health" in the "sages report", the criteria of total body doses for radionuclides as strontium 90 and iodine 131 are discussed. It emphasizes the lack of adequate solution for the effluents as carbon-14, tritium and iodine 129 as well as for the high radioactivity waste management: the toxicity of plutonium and its cancerous properties are recalled. The risks of accidents in the nuclear facilities and their effect on the population in the proximity of the power plant and the contamination from cooling media are considered as well as sabotage risks.

RADIOMETRIC INSTRUMENTS

REFER ALSO TO CITATION(S) 44147, 44584, 45278

45264 Card controlled beta backscatter thickness measuring instrument. Schlesinger, J. (to Unit Process Assemblies, Inc.). US Patent 4,079,237. 14 Mar 1978. Filed date 12 Nov 1975. 20p.

An improved beta backscatter instrument for the nondestructive measurement of the thickness of thin coatings on a substrate is described. Included therein is the utilization of a bank of memory stored data representative of isotope, substrate, coating material and thickness range characteristics in association with a control card having predetermined indicia thereon selectively representative of a particular isotope, substrate material, coating material and thickness range for conditioning electronic circuit means by memory stored data selected in accord with the predetermined indicia on a control card for converting backscattered beta particle counts into indicia of coating thickness.

45265 Ionization detectors with iron-55 as a radioactive source. Lovelock, J.E. US Patent 4,025,794. 24 May 1977. Priority date 22 Oct 1974, United Kingdom of Great Britain and Northern Ireland (UK). 4p.

An electron-capture ionization detector capable of operation at elevated tempertures and utilizing iron-55 as a radioactive source within the ionization chamber is described.

RADIATION EFFECTS ON INSTRUMENT COMPONENTS, INSTRUMENTS, OR ELECTRONIC SYSTEMS

45266 Ionization energy loss of relativistic electrons in thin silicon detectors. Ogle, W.; Goldstone, P.; Gruhn, C.; Maggiore, C. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev. Lett.;* **40**: No. 19, 1242-1244(8 May 1978).

We have measured the ionization loss of electrons with Lorenzt factors $\gamma = 2.91$ and $1.6 \times 10^4 < \text{or} = \gamma > \text{or} = 10^5$ passing through a (100.71 +- 0.15) -μm silicon detector. Our results are in agreement with accepted theory for $\gamma = 2.91$ and $\gamma = 1.6 \times 10^4$; however, for $\gamma > \text{or} = 3 \times 10^4$ our results are systematically (7 +- 2) % below the theoretical value. We suggest an explanation in terms of the finite detector thickness and a relativistic effect.

45267 Radiation hardened field effect device. Sokoloski, M.M. (to Secretary of the Army). US Patent 4,042,946. 16 Aug 1977. Filed date 8 Dec 1976. 6p.

A semiconductor device is described which utilizes metallic electrodes whose work function can be altered so as to render the device insensitive to the harmful effects caused by exposure to a hostile radiation environment or other events which deleteriously influence the threshold voltage. The gate electrodes of the device consist of materials whose work function is changed by either desorbing or absorbing hydrogen. Depending upon whether the hydride has a larger or smaller work function than the unhydrated material, the invention desorbs or absorbs hydrogen in response to a signal from a sensing circuit which is activated by changes in the threshold voltage of the device.

MISCELLANEOUS INSTRUMENTS

REFER ALSO TO CITATION(S) 44043, 44049, 44189, 44651, 44761, 45234

45268 (NUREG/CR—0054) **Electric heat balance calorimeter. Final report.** Cox, C.W.; Renken, C.J.; Brandenburg, R.W.; Perry, R.B.; Youngdahl, G.A. (Argonne National Lab., Ill. (USA)). Mar 1978. Contract W-31-109-ENG-38. 82p. (ANL—78-32). Dep. NTIS, PC A05/MF A01.

A calorimeter designed to measure power in the range of 5 to 20 mW for the assay of plutonium-bearing samples is described. In conjunction with the development of this instrument, a detailed, mathematical model for the thermal system and its interaction with the electrical system was also developed. This study produced an increased understanding of the operating characteristics of this type of instrument which may be of benefit in the development of improved instruments. The instrument has a measurement time of less than 20 minutes with a preheated sample. The measurement precision is better than 0.05% of the sample chamber power.

45269 100-ps framing-camera tube. Kalibjian, R. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Rev. Sci. Instrum.;* **49**: No. 7, 891-896(Jul 1978).

The optoelectronic framing-camera tube described is capable of recording two-dimensional image frames with high spatial resolution in the <100-ps range. Framing is performed by streaking a two-dimensional electron image across narrow slits. The resulting dissected electron line images from the slits are restored into framed images by a restorer deflector operating synchronously with the dissector deflector. The number of framed images on the tube's viewing screen equals the number of dissecting slits in the tube. Performance has been demonstrated in a prototype tube by recording 135-ps-duration framed images of 2.5-mm patterns at the cathode. The limitation in the framing speed is in the external drivers for the deflectors and not in the tube design characteristics. Faster frame speeds in the <100-ps range can be obtained by use of faster deflection drivers.

45270 Specific volume measurements of Cu, Mo, Pd, and Ag and calibration of the ruby R_1 fluorescence pressure gauge from 0.06 to 1

Mbar. Mao, H.K.; Bell, P.M.; Shaner, J.W.; Steinberg, D.J. (Geophysical Laboratory, Carnegie Institution of Washington, Washington, D.C. 20008). *J. Appl. Phys.;* **49**: No. 6, 3276-3283(Jun 1978).

The wavelength shift with pressure of the ruby R_1 fluorescence line ($\Delta\lambda$) has been calibrated in the diamond-window pressure cell from 0.06 to 1 Mbar. This was done by simultaneously making specific volume measurements of four metals (Cu, Mo, Ag, and Pd) and referring these results to isothermal equations of state derived from shock-wave experiments. The result is P (Mbar) = (19.04/5) $\{[(\lambda_0+\Delta\lambda)/\lambda_0]^5-1\}$, where λ_0 is the wavelength measured at 1 bar.

45271 Description of a polarized source of He I radiation for surface studies. Carlson, T.A.; Dress, W.B.; Ward, F.H.; Agron, P.A.; Nyberg, G.L. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Rev. Sci. Instrum.;* **49**: No. 6, 736-740(Jun 1978).

A polarized radiation source has been designed and built for use in angular-resolved photoelectron spectroscopy on surfaces of single crystals under ultrahigh vacuum. The light from a discharge in helium is polarized by a triple reflection from a series of gold mirrors, producing a plane-polarized beam of He I radiation (21.22 eV) with a polarization of 80%. The plane of polarization can be rotated through more than 180° without breaking vacuum. Details of the construction of the lamps are given, together with how it is integrated into the overall operation of the electron spectrometer. As an illustration of the lamp's potential, data are shown on the photoemission studies of the (110) and (111) faces of copper as a function of both the orientation angle of the crystal and the polarization vector. A brief discussion of the future development and possible uses of the lamp is included.

45272 Device for measuring radiation absorption in a layer of a body. Kowalski, G. (to U.S. Philips Corp.). US Patent 4,075,490. 21 Feb 1978. Priority date 19 Apr 1975, German, Federal Republic of (F.R. Germany). 6p.

A device is described for measuring the absorption of radiation in a layer of a body, utilizing a radiator emitting a fanned radiation beam which passes through the body and which is measured by a number of adjacently arranged detectors. The radiator/detector system is rotated with respect to the body during the measurement. Integral measuring values of mutually intersecting sets of parallel strips are used for calculating the absorption. To this end, the device comprises means for sampling signals supplied by the detectors at different instants and/or means for effecting the sampling after different signal delay times.

45273 Fan beam x- or γ-ray 3-D tomography. Boyd, D.P.; Goitein, M. (to Board of Trustees of Leland Stanford Junior Univ.). US Patent 4,075,492. 21 Feb 1978. Filed date 29 Nov 1974. 30p.

A fan-shaped beam of penetrating radiation, such as x-ray or γ-ray radiation, is directed through a slice of the body to be analyzed to a position sensitive detector for deriving a shadowgraph of transmission or absorption of the penetrating radiation by the body. A number of shadowgraphs are obtained for different angles of rotation of the fan-shaped beam relative to the center of the slice being analyzed. The detected fan beam shadowgraph data is reordered into shadowgraph data corresponding to sets of parallel paths of radiation through the body. The reordered parallel path shodowgraph data is then convoluted in accordance with a 3-D reconstruction method by convolution in a computer to derive a 3-D reconstructed tomograph of the body under analysis. In a preferred embodiment, the position sensitive detector comprises a multiwire detector wherein the wires are arrayed parallel to the direction of the divergent penetrating rays to be detected. A focussed grid collimator is interposed between the body and the position sensitive detector for collimating the penetrating rays to be detected. The source of penetrating radiation is preferably a monochromatic source.

45274 Axial tomography. Brueckner, K.A.; Lewis, J.H. (to Xonics, Inc.). US Patent 4,072,289. 7 Feb 1978. Filed date 10 Sep 1976. 8p.

An analog method and apparatus are described for producing an axial tomographic image of an object, typically the human body, using a detector for receiving radiation along a plurality of sets of paths, with the sets of paths overlapping each other, and providing a plurality of sets of detector output signals. Prior art devices exist for producing the detector output singals, which signals are then manipulated in a digital computer to produce the desired image. In one embodiment of the present invention, the detector output signals are summed in a storage tube and the stored signals are read in an inversely proportional relation, providing another signal for storage in another storage tube which is then read with a Laplacian relation to give a video signal for display and/or recording. Optical and electrostatic storage systems are also disclosed.

45275 Effect of a weak field asymmetry on stability in an adiabatic magnetic confinement system. Serdyuk, O.V. (Institute of Nuclear Research, Academy of Sciences of the USSR, Moscow). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 464-465(Nov 1977).

The effect on particle motion of perturbations in the axial symmetry of a meson magnetic confinement system is disscussed.

45276 Automatic range selector. McNeilly, C.E. (to Energy Research and Development Administration). US Patent 4,001,683. 4 Jan 1977. Filed date 25 Apr 1975. 8p.

PAT-APPL-571,878.

A device is provided for automatically selecting from a plurality of ranges of a scale of values to which a meter may be made responsive, that range which encompasses the value of an unknown parameter. A meter relay indicates whether the unknown is of greater or lesser value than the range to which the meter is then responsive. The rotatable part of a stepping relay is rotated in one direction or the other in response to the indication from the meter relay. Various positions of the rotatable part are associated with particular scales. Switching means are sensitive to the position of the rotatable part to couple the associated range to the meter.

WELL LOGGING INSTRUMENTATION

REFER ALSO TO CITATION(S) 44147

45277 Method and apparatus for running and retrieving logging instruments in highly deviated well bores. Marquis, G.L. (to Dresser Industries, Inc.). US Patent 4,082,144. 4 Apr 1978. Filed date 1 Nov 1976. 8p.

The system consists of means for running a logging instrument and a long semi-rigid extension on a logging cable through open-ended drill pipe. A head on the upper end of the extension conforms sufficiently close to the inside diameter of the drill pipe that pump pressure down the drill pipe develops thrust across the head to push the extension and logging instrument down the well bore. A catcher sub at the lower end of the drill pipe prevents the extension from being pumped out the bottom of the drill pipe. As the extension and logging instrument are pulled back into the drill pipe by the logging cable, well bore measurements are made and recorded over the interval below the bottom of the drill pipe. The extension consists of a number of sections that are joined together on top of the instrument as the instrument is lowered into the drill pipe on the logging cable, the extension sections each having a slot along their entire length in order that the extension will fit around the logging cable. In one embodiment, the extensions are formed of a threaded steel insert connected to a dissimilar metal, for example, aluminum, by a special welding technique in order to enable the entire extension system to be lighter weight and thus supportable by the logging cable. A cable tension adapter sub at the uppermost top extension causes fluid ports to be rerouted to enable free fluid movement downward through the cable tension adapter sub and restricted movement in the upward direction. This minimizes swab load when logging out of a well.

45278 Neutron borehole logging correction technique. Goldman, L.H. (to Schlumberger Technology Corp.). US Patent 4,078,174. 7 Mar 1978. Filed date 28 Jul 1976. 12p.

In accordance with an illustrative embodiment of the present invention, a method and apparatus is disclosed for logging earth formations traversed by a borehole in which an earth formation is irradiated with neutrons and gamma radiation produced thereby in the formation and in the borehole is detected. A sleeve or shield for capturing neutrons from the borehole and producing gamma radiation characteristic of that capture is provided to give an indication of the contribution of borehole capture events to the total detected gamma radiation. It is then possible to correct from those borehole effects the total detected gamma radiation and any earth formation parameters determined therefrom.

45279 Method and apparatus for investigating earth formations utilizing microwave electromagnetic energy. Rau, R.N. (to Schlumberger Tech. Corp.). US Patent 4,052,662. 4 Oct 1977. Filed date 19 Feb 1976. 14p.

A method and apparatus are described for investigating earth formations surrounding a borehole by injecting microwave electromagnetic energy into the formations and then taking measurements which relate to the propagation of such energy in the formations. In the preferred form of the invention, the injected microwave energy establishes a lateral wave which travels in the formations adjacent the interface between the mudcake and the formations. Energy signals from the lateral wave are received at first and second receiving locations. The phase difference between signals received at the first and second receiving locations is measured. Also measured is the relative attenuation as between signals received at the two receiving locations. The loss-corrected dielectric constant associated with the formations surrounding the area between the first and

second receiving locations is then obtained by judiciously combining the phase and attenuation measurements.

EXPLOSIONS AND EXPLOSIVES

45280 Determination of voltage in exploding-foil experiments. Logan, J.D. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). *J. Appl. Phys.;* **49**: No. 6, 3590-3592(Jun 1978).

A basic problem in exploding-foil experiments is the placement of the voltage probes since they cannot be located at the ideal position where the voltage drop shoud be measured. As a result, they are placed so that they introduce error into the measurements. Therefore, knowing how much experimental error exists in these voltage measurements is quite important. In this study, a theoretical determination of the potential drop in a nonlinear conductor is made using both steady-state and dynamic models. Estimates of the magnitude of experimental errors are calculated.

CHEMICAL

REFER ALSO TO CITATION(S) 44055, 45078

45281 (UCID—17822) **Blast forecasting guide for the Site 300 Meteorology Center.** Odell, B.N.; Pfeifer, H.E.; Arganbright, V.E. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 1 Jun 1978. Contract W-7405-ENG-48. 133p. Dep. NTIS, PC A07/MF A01.

These step-by-step procedures enable an occasional operator to run the Site 300 Meteorological Center. The primary function of the Center is to determine the maximum weight of high explosives that can be fired at Site 300 under any given meteorological conditions. A secondary function is to supply weather data for other programs such as ARAC (Atmospheric Release Advisory Capability). Included in the primary function are radar and theodolite operations for balloon tracking; calculation of temperatures for various altitudes using Oakland weather obtained from a teletype; computer terminal operation to obtain wind directions, wind velocities, temperatures, and pressure at various altitudes; and methods to determine high-explosive weight limits for simple inversions and focus conditions using pressure-versus-altitude information obtained from the computer. General information is included such as names, telephone numbers, and addresses of maintenance personnel, additional sources of weather information, chart suppliers, balloons, spare parts, etc.

45282 (UCRL—50019-77-1, pp 7-11) **Explosives technology.** 19 Jan 1978.

In Organic Materials Division quarterly report, January—March 1977.

Research progress is reported on the following: (1) safe explosives for shaped charges; (2) actuator triggered by simultaneous burnup of two explosive trains; (3) theoretical studies of the soliton-like behavior of shocks in one-dimensional lattices; and (4) physical properties, stability, and sensitivity of liquid explosives. (TFD)

NUCLEAR

REFER ALSO TO CITATION(S) 45323

45283 (AD-A—048778) **Development of an artificial viscosity function. Final report.** Lunn, P.W.; Happ, H.J. III; Needham, C.E. (Air Force Weapons Lab., Kirtland AFB, N.Mex. (USA)). Sep 1977. 39p. (AFWL-TR—77-53). Availability: Microfiche copies only.

The hydrodynamics code HULL used by the Air Force Weapons Laboratory (AFWL) uses the Von Neumann-Richtmeyer method to maintain stability in the numerical computation of a propagating shock. This method adds a pseudoviscous term to the pressure in a compression region. Care is needed in the application of this method, however. Too little artificial viscosity will not maintain stability. Too much will 'smear' the shock over many zones, making the shock practically continuous. The AFWL has developed a relation which expresses the linear viscosity coefficient as a function of maximum density. The effect of this variable viscosity coefficient is to maintain stability while limiting the smear to 10 zones for overpressure levels of 2 psi to 1200 psi in air.

45284 (UCRL—50016-78-1, pp 15-20) **Proof test of the ATLAS Trailer Shock Isolation System.** 31 Mar 1978.

In Mechanical Engineering Department quarterly report, January—March 1978.

A new shock isolation system for Nevada Test Site (NTS) trailers that minimizes set up time and overall manpower costs is described. The system was designed as part of the Augmented Test Logistics System (ATLAS), which is aimed at reducing overall operation costs for underground nuclear tests by doing much of the preliminary work in Las Vegas. The new shock system allows rapid set up of diagnostic trailers moved from the ATLAS Las Vegas site to NTS. Handling time is reduced: the old trailer-shock-isolation system with 680-kg beams took 9 days to set up while the new system with 130-kg modules takes only 4 days to set up for a typical event with 9 trailers. Shock isolation systems are required because a nuclear detonation can cause the ground to move vertically up to 3 m, which can induce impact accelerations in excess of 500 m/s^2 at the base of the trailer. Without proper shock isolation, the diagnostic trailers suffer data loss and equipment damage. Recent successful proof tests of the new ATLAS Trailer Shock Isolation System (ATSI) are summarized. Instrumented free fall drop tests at 0.3, 0.9, and 1.8 m were performed using trailer 9137 at the ATLAS site. The purpose of these tests was to verify the structural integrity of the new ATSI modules and the reinforced trailer structure.

CIVIL USES

45285 (PNE-RB—79) **Rio Blanco radiation contamination clearance report.** (Eberline Instrument Corp., Santa Fe, N.Mex. (USA)). Feb 1978. Contract EY-76-C-08-0669. 47p. Dep. NTIS, PC A03/MF A01.

Project Rio Blanco was a cooperative research effort by the U. S. Department of Energy (DOE), formerly the U.S. Energy Research and Development Administration, and industry to assess the feasibility of using nuclear explosives to stimulate natural gas from low permeability formations. The radiological health and safety operations required for site cleanup and restoration to return the site to approximately its original condition are described. These operations were conducted from July 1976 to November 1976. All equipment contaminated during gas production test activities was decontaminated to well below applicable release criteria and was released for unrestricted use. The radiological health operations were successful. No radioactive contamination of ground water was detected. The radiological instrumentation survey indicated that no radiation levels above ambient background remain onsite. Only tritium in insignificant amounts remains in the onsite surface soil as determined by soil sampling.

WEAPONRY

REFER ALSO TO CITATION(S) 45318

45286 (AD-A—048802) **Tactical implications of air blast variations from nuclear tests. Final report, 15 April—30 November 1976.** Cockayne, J.E.; Lofgren, E.V. (Science Applications, Inc., McLean, Va. (USA)). 30 Nov 1976. Contract DNA001-76-C-0284. 160p. (SAI—76-677-WA). NTIS PC A08/MF A01.

The objective was to assess the rationale for additional nuclear tests which would produce a better predictive capability for tactical blast environments. The work described includes the following: refinement and concise synopsis of the theoretical and empirical basis for the rationale assessment; testing of the assumption of a lognormal distribution for the measurements which implies an uncertainty proportional to the measurements; this assumption simplifies the methodology; and an analysis of variance for some blast data to ascertain if systematic errors (biases) could exist which might require additional measurements of a weapon produced environment to resolve.

45287 (LA-tr—78-48) **Neutron bomb.** (CEA, 75 - Paris (France). Direction des Applications Militaires). 1978. Translation of French report. 6p. Dep. NTIS, PC A02/MF A01.

A brief and general description of the neutron bomb is presented. Tactical uses of the bomb are elucidated. (TFD)

EXPLOSION DETECTION

REFER ALSO TO CITATION(S) 45407

ENVIRONMENTAL SCIENCES,

ATMOSPHERIC

BASIC STUDIES

REFER ALSO TO CITATION(S) 45436, 45479

45288 **Interannual variability of the ocean—atmosphere system.** Reiter, E.R. (Department of Atmospheric Science, Colorado State University, Ft. Collins 80523). *J. Atmos. Sci.;* **35**: No. 3, 349-370(Mar 1978).

Evidence is derived from observational data that the trade wind circulations in both hemispheres over the Pacific are related to the sea surface temperature (SST) anomalies in the North Pacific. The equatorward component of the surface trade winds leads the North Pacific SST anomalies by approximately 20 months, equivalent to the half-rotation time of the Pacific gyre.Long-term trends in the Pacific trade wind regime appear to have an influence on hemispheric and global mean temperatures. The trade wind anomalies also seem to be tied to meridional atmospheric pressure-and temperature-gradient anomalies which, in turn, appear to respond to anomalies in the meridional SST gradients. Thus a closed feedback loop is demonstrated, in which SST anomalies in the North Pacific generate trade wind anomalies which promote the development of North Pacific SST anomalies of opposite sign. The trade wind surges also are related to El Nino through a feedback involving the hydrological cycle and upwelling of cold water forced by Ekman pumping.

CHEMICALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 44088, 45235, 45324, 45357

45289 (AD-A—048750) **The 1976 NRL air quality data. Final report.** Stamulis, A. (Naval Research Lab., Washington, D.C. (USA)). Nov 1977. 45p. (NRL-MR—3652). NTIS PC A03/MF A01.

Air quality data obtained during the calendar year 1976 at the NRL air monitoring site are reported for ozone (O3), sulfur dioxide (SO2), nitrogen dioxide (NO2), total hydrocarbons (THC), methane (CH4), non-methane hydrocarbons (RHC), carbon monoxide (CO), wind speed, and wind direction. The instruments measuring the above variables are interfaced to a data acquisition system including a magnetic tape recorder. The input on the magnetic tape is in 5-minute increments (averages) for one month's accumulation of data. Subsequently, a computer printout is available for reporting the monthly air quality data. The yearly summary is a composite version of the monthly data. (Author)

45290 (CONF-780611—3) **Relationships between removal processes and residence times for atmospheric pollutants.** Slinn, W.G.N. (Oregon State Univ., Corvallis (USA)). 24 Mar 1978. Contract EY-77-S-09-0980. 50p. Dep. NTIS, PC A03/MF A01.

From AIChE symposium; Philadelphia, PA, USA (4 Jun 1978).

This report is concerned with improving estimates for the residence times of atmospheric trace constituents in various atmospheric reservoirs. Residence times are defined only for steady-state conditions; i.e., when the net growth rate vanishes. The most useful case of vanishing net growth rate is when the total growth rate is equal to the decay rate. It is demonstrated that the most important advance towards improving estimates of pollutant residence times is through proper choices of reservoirs. Chosen reservoirs should possess the following features: steady-state conditions, uniform mixing ratio throughout or throughout specified subreservoirs, and subreservoirs chosen in which removal rates can be treated as approximate constants. An example of a poorly mixed reservoir, the stratosphere, is discussed. In another example, it is suggested that commonly used reservoirs for atmospheric CO_2 have been chosen poorly and that a substantial portion of the anthropogenic CO_2 released during the past 50 years may still be mixing into the stratosphere. In another example, it is suggested that determination of the dry deposition velocity for accumulation-mode aerosol particles may not be so important as previously thought. To improve estimates for the atmospheric residence times of these particles, it is important to increase knowledge of what is called the ascension velocity.

45291 (DP—1469) **Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975.** (Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.). Apr 1978. Contract EY-76-C-09-0001. 63p. Dep. NTIS, PC A04/MF A01.

Concern for man's impact on his environment requires an understanding of transport and dispersion of airborne pollutants on regional, continental, or global scales. Collection of experimental data in which the transport and diffusion processes can be isolated from source and sink factors is needed in order to help this understanding. A test performed at the Savannah River Plant on December 10, 1975, to obtain this kind of data was part of a DOE-supported program in cooperation with other laboratories and groups. The object of this test was to obtain data by using several tracers which are inert and non-depositing in order to isolate the effects of long-range transport and diffusion. The tracers used in this test are sulfur hexafluoride, methane-20 and -21 (as developed by the Los Alamos Scientific Laboratory), and routine emissions of krypton-85. Considerable experience was gained in release, sampling, processing, and analysis of these tracers. Data from this test will allow the study of transport and dispersion of plumes to 100 km from a point source. Considerable data both on the ground and by aircraft at these distances were obtained. Collection of sulfur hexafluoride along with the two methane tracer systems were compared and a discrepancy between them was seen. The peak concentration and concentration summed over a sampling line show the methane to be low by about a factor of four relative to the sulfur hexafluoride. Sulfur hexafluoride appears to agree with the krypton-85 and mass balance calculations. Some explanations for the methane-sulfur hexafluoride discrepancy are given but no positive conclusion for this difference can be reched at this time. Conduct of the test and the data are described in this report.

45292 (EPA—450/1-77-002) **National air quality and emissions trends report, 1976.** (Environmental Protection Agency, Research Triangle Park, N.C. (USA)). Dec 1977. 63p. Environmental Protection Agency, Research Triangle Park, NC.

This report presents national and regional trends in air quality through 1976 for total suspended particulate, sulfur dioxide, carbon monoxide, nitrogen dioxide and oxidants. The change in the number of people exposed to air quality levels above the National Ambient Air Quality Standards is emphasized for four major metropolitan areas: the New York-New Jersey-Connecticut Air Quality Control Region; the Los Angeles Basin; the City of Chicago and Metropolitan Denver. All areas show long-term improvement in reducing adverse pollution levels. A major feature of this report is the presentation of multi-color air quality maps for total suspended particulate, sulfur dioxide and photochemical oxidants. The analyses in this report are based on the data collected through the extensive monitoring activities conducted by Federal, State and local air pollution control agencies. Nationwide emissions for the period 1970 to 1976 are also presented.

45293 (NP—23191) **Environmental quality. The sixth annual report of the Council on Environmental Quality.** (Council on Environmental Quality, Washington, D.C. (USA)). Dec 1975. 800p. GPO $6.60.

Separate abstracts were prepared for the seven chapters of the report. Seven appendices are included on the staff of the CEI, the National Environmental Policy Act, the Environmental Quality Improvement Act, preparation of environmental impact statements, federal environmental program budgets, and advisory committees of the CEI. (HLW)

45294 (NP—23191, pp 42-298) **Perspectives on the environment.** Dec 1975.

In Environmental quality. The sixth annual report of the Council on Environmental Quality.

Air pollution is discussed with regard to stationary sources, mobile sources, air quality planning, auto emission, and land use. Water pollution is discussed with regard to effluent guidelines, municipal pollution, safe drinking water, industrial pollution, toxic pollutants, and sludge disposal. Noise pollution is discussed with regard to EPA regulations, aircraft and airport noise, and occupational noise standards. Solid wastes are discussed with regard to resource recovery and incentives for recycling. The following hazardous pollutants are discussed: pesticides, arsenic, coke oven emissions, vinyl chloride, fluorocarbons, lead, asbestos, and organochlorine compounds. Other topics discussed are energy research and development, energy resources, land use, water resources, grazing in national forests, timber management, national park policies, wilderness preservation, and wildlife management. (HLW)

45295 (NP—23191, pp 299-493) **Environmental conditions and trends.** Dec 1975.

In Environmental quality. The sixth annual report of the Council on Environmental Quality.

Air quality is discussed with regard to criteria pollutants, emissions, ambient air monitoring, and interpreting and reporting air quality. Water quality is discussed with regard to criteria, nutrients, eutrophication, and federal water quality monitoring networks. The following hazardous pollutants are discussed: DDT, aldrin, dieldrin, PCB, and mercury. Living resources, population distribution, energy technology, and environmental data are also discussed. (HLW)

45296 (NP—23191, pp 665-678) **CEQ studies.** Dec 1975.

In Environmental quality. The sixth annual report of the Council on Environmental Quality.

Some topics discussed are as follows: fluorocarbons and the environment; air pollution indices; analysis of water quality; regional energy studies; recreation and water supply reservoirs; the Delaware River basin; and biological monitoring. (HLW)

45297 (PB—274011) **High-sensitivity Fourier transform NMR. Intermolecualr interactions between environmental toxic substances and biological macromolecules. Report for 2 October 1974—1 October 1976.** Levy, G.C. (Florida State Univ., Tallahassee (USA). Dept. of Chemistry). Sep 1977. 96p. NTIS PC A05/MF A01.

This project explored the feasibility of developing new techniques for evaluation of the effects of environmental toxic materials on complex biopolymer systems using high sensitivity Fourier transform nuclear magnetic resonance (NMR) spectroscopy. Commerical instrumentation available in 1974—1975 did not possess adequate sensitivity, and thus one goal of this project was to increase spectral sensitivity, especially for the ^{13}C and other nuclides having low magnetogyric ratios. Initially, modifications to an existing Bruker HX-270 spectrometer provided moderate improvement in sensitivity for ^{13}C and substantial sensitivity increase for ^{15}N observation. During the second (last) year of this grant, a new instrument design was initiated. Several studies were begun to elucidate the nature of chlorophenol interactions in liquids, and when incorporated into lacithin bilayer membrane models. Variable frequency ^{13}C spin lattice relaxation time measurements were used to probe copperativity of molecular chain dynamics in some simple molecules and in two complex synthetic polymers. A new theoretical modification involving a non-exponential autocorrelation function and also allowing for multiple independent internal rotations allowed effective analysis of a large experimental set.

45298 (PB—274530) **Measurement of rate constants of importance in smog. Final report, April 1973—July 1977.** Barker, J.R.; Benson, S.W.; Mandenhall, G.D.; Golden, D.M. (SRI International, Menlo Park, Calif. (USA)). Oct 1977. 145p. NTIS PCA07/MF A01.

To provide understanding of elementary reactions of importance in smog, a three-part investigation has been carried out: (1) experimental determinations of certain elementary reaction rate constants, (2) development of general gechniques for estimating elementary reaction rate constants, and (3) estimation of many reactions important in smog. Specific estimated rate constants included the following reactions: (1) Decomposition of alkoxy radicals; (2) Isomerizatin of alkoxy radicals; (3) Reactions of alkoxy radicals with oxygen, and (4) The reaction $Ho_2 + NO_2$ yields Ho_2NO_2. In addition, a limited number of computer simulations were carried out for the photo-oxidation of n-butens and propene.

45299 (PB—275760) **Environmental quality control - governmental finances: fiscal year 1974—1975. State and local government special studies.** (Bureau of the Census, Washington, D.C. (USA)). Apr 1977. 40p. (GSS—76-83).

Expenditure and revenue data are shown for water quality control, air quality control, land quality control, land quality control (solid waste management), and other environmental control by the Federal Government, the 50 State governments, the 58 largest county governments, and the 48 largest city governments. Data on local government revenue and expenditure for sewerage activities and sanitation other than sewerage activities are presented by 74 major standard metropolitan statistical areas and component counties.

45300 (PB—276169) **Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974—April 1977.** Leonard, R.P.; Ziegler, R.C.; Brown, W.R.; Yang, J.Y.; Reif, H.G. (Calspan Corp., Buffalo, N.Y. (USA)). Apr 1977. Contract EPA-68-01-2604. 59p.

This report is the result of a study commissioned by the U.S. Environmental Protection Agency (EPA) to assess the waste generation, treatment, and disposal practices in the primary metals industry. These studies serve to provide EPA with: (1) an initial data base concerning the current and projected types and quantities of industrial wastes, applicable treatment and disposal technologies and their associated costs; (2) a data base for technical assistance activities; (3) a background for guidelines development work. The definition of 'potentially hazardous waste' in this study was developed based upon contractor investigations and professional judgment. Thus, the reader is cautioned that the data presented in this report constitutes only the contractor's assessment of the hazardous waste management problems in this industry. The primary and secondary metal smelting and refining categories included in this report are the following: Copper (SIC 3331); Lead (SIC 3332); Zinc (SIC 3333); Aluminum (SIC 3334); Antimony (SIC 3339); Mercury (SIC 3339); Titanium (SIC 3339); Tungsten (SIC 3339); Tin (SIC 3339); Magnesium (SIC 3339); Cadmium (SIC 3339). The primary metal smelting and refining industries use ore concentrates or other natural resources as raw material, whereas the major raw materials for secondary industries is scrap metal.

45301 (PB—276170) **Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume II. Primary and secondary nonferrous smelting and refining. Final report, May 1974—April 1977.** Leonard, R.P.; Ziegler, R.C.; Brown, W.R.; Yag, J.Y.; Reif, H.G. (Calspan Corp., Buffalo, N.Y. (USA)). Apr 1977. Contract EPA-68-01-2604. 325p.

This volume presents the results of studies of the U.S. primary and secondary non-ferrous smelting and refining industry. Characteristics of each industry sector, including plant locations, production capacities, and smelting and refining processes, have been identified and described. Land-disposed or stored residuals, including slags, dusts, and sludges have been identified and characterized for physical and chemical properties. Current methods employed by the primary metals industry for the disposal or storage of possess and pollution control residuals on land are described. Principal methods include lagoon storage of sludges and open dumping of slags. Methods of residual treatment and disposal considered suitable for adequate health and environmental protection have been provided. Finally, the costs incurred by typical plants in each primary smelting and refining category for current and environmentally sound potentially hazardous residual disposal or storage on land have been estimated.

45302 (PB—276188) **Tunable laser spectral survey of molecular air pollutants. Final report.** Mooradian, A.; Pine, A.S. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). May 1977. 116p.

The purpose of this program is to survey and catalog high-resolution near-infrared spectra of several hydrocarbons and other light molecules of atmospheric significance, using a unique difference-frequency laser spectrometer. Such spectra can be applied to the detection, spectroscopic identification and quantitative monitoring of molecular air contaminants. Monitoring sensitivity of laser systems is increased over conventional incoherent optical techniques because of the high spectral brightness of the tunable lasers which improves the capabilities for fully resolved, long-path absorption spectroscopy. The molecular spectral surveys and analyses presented in this report provide information on spectral signatures, absolute absorption intensities, and pressure and temperature effects on the spectrum of the molecules under observation. New high-resolution spectra of methane and formaldehyde in the region of their fundamental C-H stretching bands are presented, as is a precise theoretical analysis of the 4 micrometers mu (1) + mu (3) combination band of SO2 which can be used for atmospheric modeling. Also discussed are some instrumentation advances in the laser spectrometer system which improves its precision and data-handling capabilities. (Portions of this document are not fully legible)

45303 (UCRL—52426) **Feasibility study for computerized automation of EPA Region II Technical Support Branch.** Stephens, F.B.; Morris, W.F.; Barton, G.W. Jr.; Fisher, E.R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 9 Feb 1978. Contract W-7405-ENG-48. 35p. Dep. NTIS, PC A03/MF A01.

Three options are presented for automating the chemistry laboratories at the Surveillance and Analysis Division, Environmental Protection Agency , at Edison, New Jersey. The laboratory served New York State, New Jersey and Puerto Rico. Each option was found to be cost-effective. For two of the systems, existing EPA laboratory software would be used without (option 1) and with (option 2) data management. For the third system, laboratory and data functions would be implemented on a different computer (PDP-11) from those now installed. Option 2, the most favorable system, would make use of existing programs and data-management features now being developed; it would break even in 1.82 y and accumulate $373,928 in the five years after installation.

45304 **Application of X-ray photoelectron spectroscopy to the study of fly ash.** Campbell, J.A.; Smith, R.D.; Davis, L.E. (Physical Sciences Department, Battelle, Pacific Northwest Laboratories, Richland, Washington 99352). *Appl. Spectrosc.;* **32**: No. 3, 316-319(May 1978).

X-ray photoelectron spectroscopy has been used to identify and determine the oxidation states of a number of major and minor elements present on the surface of fly ash particles. With the use of a sputtering-etching procedure, relative concentrations as a function of depth were obtained for Si, Al, Fe, Ca, Na, C, O, and S. The concentrations of Na, C, O, and S were found to decrease and Si, Al, and Fe were found to increase upon sputtering to a depth of approximately 50 A.

45305 **How much more CO_2 can we take.** Panrath, J. (Umweltbundesamt, Berlin (Germany, F.R.)). *Umsch. Wiss. Tech.;* **77**: No. 24, 811(Dec 1977). (In German).

45306 Role of increasing CO_2 concentrations in the atmosphere. *Umwelt (Inf. Bundesminist. Innern);* No. 59, 47-48(Dec 1977). (In German).

Short communication only.

45307 Issuing of guidelines - role and activities of the VDI Kommission Reinhaltung der Luft. Grefen, K. (Verein Deutscher Ingenieure, Duesseldorf (Germany, F.R.). Kommission Reinhaltung der Luft). *Staub-Reinhalt. Luft;* **37**: No. 11, 406-412(Nov 1977). (In German).

As an aid to make decisions for legislative projects on clean air prevention as well as for measures to be taken to reduce emission and immission, the establishment of technical standards is, because of its various and complicated uncertainties, an especially important and topical co-operative task. The Verein Deutscher Ingenieure (VDI) had agreed before anyone else to establish the necessary technical-scientific work of principles for it on voluntary self-responsibility basis. The establishment of the standards of principles in form of VDI-guidelines according to the state of art has been ensued by the VDI-Kommission Reinhaltung der Luft whose working results have been influencing the clean-air-prevention scene of 20 years by this time.

45308 Origins, development, and targets of the VDI Kommission Reinhaltung der Luft. Kraemer, J. *Staub-Reinhalt. Luft;* **37**: No. 11, 401-406(Nov 1977). (In German).

For 20 years the Division of Air Pollution Prevention (Kommission Reinhaltung der Luft) has been an independent self-responsible special division within the Association of German Engineers (Verein Deutscher Ingenieure). This gives the occasion to draw up an overall view of some main phases of the founding and growth of this division and its principal tasks in order to submit an aspect on its purpose and activities.

45309 CO_2 risk. Change in climate by increasing combustion within the next decades. Hampicke, U. (Essen Univ. (Gesamthochschule) (Germany, F.R.). Arbeitsgruppe Umwelt, Gesellschaft, Energie). *Umsch. Wiss. Tech.;* **77**: No. 18, 599-606(Sep 1977). (In German).

Carbon dioxide, CO_2, develops in all combustion processes. The CO_2 content in the atmosphere has increased by almost 14% during the past hundred years. The greenhouse effect has long been known: The more CO_2 in the atmosphere, the more the earth surface is to heat up. Within the next 50 years doubling of the CO_2 content in the atmosphere can be possible. Will the enormous ice quantities at the north and south pole melt. Will countries in moderate climates be changed into deserts. Or would such change in climate lead to increased rainfalls so that the world nutrition situation would improve. Many test results now available indicate that a doubling of the CO_2 content in the atmosphere would be an adventurous climatic test, the results of which nobody can predict. However, indications exist which say that the increase of CO_2 content in the atmosphere will not take place as fast as was often predicted.

45310 (PB—276342-T/SL) Air conservation. Volume 10, Number 6(56), 1976. Translated by A. Skup from *Ochr. Powietrza;* **10**: No. 6, vp.(1976). 85p. (TT—76-54024/6).

Formaldehyde determination in the atmospheric air and in precipitation; The use of nonwoven filter fabrics for dust removal from industrial gases; Hot-gas particulate emission control; SO2 concentration monitoring in the Ojcow National Park; Legal aspects and organization; Industrial briefs; New technology; Patent review; and News in brief.

45311 Metabolic cycles for toxic elements in the environment. A study of kinetics and mechanism. Wood, J.M. (Univ. of Minnesota, St. Paul). pp 105-112 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The evolution of metabolic pathways to cope with the naturally occurring toxic compounds, both for their synthesis and degradation, provides a balance for the natural levels of such compounds. The dynamic aspects of this problem cannot be overemphasized, because for the metabolism of toxic compounds one must be aware of the circumstances which lead to an increase in the rate of synthesis or release of toxic metabolites compared to the rate of their degradation or removal. The danger associated with naturally occurring toxic metabolites largely depends on their distribution in nature, which may or may not place them in a situation where they can pose serious public health problems. The toxic elements are undoubtedly the most difficult to study because background levels are always present in the environment, and a small perturbation on an ecosystem could bring about a rapid increase in the rate of synthesis of these compounds.

45312 Environmental lead distribution in relation to automobile and mine and smelter sources. Rolfe, G.L. (Univ. of Illinois, Urbana); Jennett, J.C. pp 231-241 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Leading mining and milling operations as well as automobile emissions contribute heavy metals to stream sediments and biota. These materials are transported out of the ecosystem to other systems during times of runoff. This is rarely detected by regulatory agencies because of the use of filtered samples for analysis. Preliminary studies do not indicate biological magnification of lead in aquaic food chains. Air quality studies have shown that the main source of heavy metals in the immediate area of smelting operations is fugitive sources; beyond a few thousand feet the stack emissions are the main contributors of heavy metals. Automobile emissions are the major source in the Illinois study. The soil anomaly around the smelter extends at least 15 miles north and south. Most of this lead is retained in the leaf litter rather than passed on to the soil. The soil anomaly in the Illinois ecosystem is restricted to a narrow band (+- 40 m) along roadways. Concentrate transport contributes to heavy metals exposure near both the roads and railroads used near mines and smelters. Automobile emissions contribute to soil, plant, and animal anomalies along highways. High levels of lead in or on samples of vegetables, particularly lettuce, have been detected in areas where lead is mined, milled, and smelted. These materials are only a small part of human diets and are not considered too dangerous at this time, though the effects remain to be studied. Load levels in the vegetation surrounding the smelter are high for at least 7 miles from the 200 ft stack.

45313 Canadian experience with the reduction of mercury at chlor-alkali plants. Flewelling, F.J. (Canadian Industries Ltd., Montreal). pp 253-256 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

During the $3^1/_2$ years since early 1970, activities in Canada to reduce environmental pollution by mercury from chlor-alkali plants have been concentrated primarily on the mercury being discharged directly to waterways in effluent streams. Atmospheric mercury emissions have received much less attention, and the matter of the ultimate disposal of mercury-contaminated solids and sludges is still largely unresolved. This paper reviews briefly the steps which have been taken in all three areas, attempts to estimate the extent to which environmental pollution has been reduced, and considers the work still remaining to be done.

RADIOACTIVE MATERIALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 44253, 44254, 45324

45314 (GJT—21) Laboratory research on tailings stabilization methods and their effectiveness in radiation containment. Macbeth, P.J.; Jensen, C.M.; Rogers, V.C.; Overmyer, R.F. (Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)). Apr 1978. Contract EY-76-C-13-1658. 112p. Dep. NTIS, PC A06/MF A01.

This report describes a study of various methods, techniques, and materials for stabilizing uranium mill tailings to reduce radon exhalation. Radon emanation from tailings particles, radon exhalation from tailings, and methods that could be used to reduce radon exhalation from tailings piles are discussed. Surface radon flux and soil gas concentrations were measured in experiment chambers or columns consisting of uranium tailings and various types and thicknesses of cover materials. The applicability of diffusion theory was examined and effective diffusion coefficients were determined for clay, soil, and sand. The variation of radon flux with atmospheric effects and moisture also was investigated. The effectiveness of several types of chemical stabilizers for both volumetric and surface application in reducing radon exhalation is reported. Some volumetric stabilizers reduced radon flux by 90 percent or more. Radon flux was determined through the use of charcoal gas mask canisters, and flux accumulation chambers sampled by Lucas cells. Both of these techniques are described. Soil gas concentration was sampled with Lucas cells and counted with a sodium iodide scintillation spectrometer system. Emanating power of uranium tailings was measured for several particle sizes and found to be relatively constant at about 20 percent. Two types of grasses were found that would grow in tailings if sufficient water and fertilizer were provided. The effect of vegetation on radon exhalation was not determined.

45315 (LA—7263-MS) **Environmental surveillance at Los Alamos during 1977.** (Los Alamos Scientific Lab., N.Mex. (USA)). Apr 1978. Contract W-7405-ENG-36. 87p. Dep. NTIS, PC A05/MF A01.

This report documents the environmental monitoring program conducted at the Los Alamos Scientific Laboratory (LASL) in 1977. Data and interpretation show that radiation and radioactivity in the environment as a result of LASL operations were at levels well below applicable U.S. Department of Energy guidelines. The radiation doses attributable to LASL operations potentially received by members of the public were small fractions of naturally present background radiation. Data on non-radioactive releases from LASL operations were collected and compared, where appropriate, to federal and state standards. Effluents from several sanitary sewage-treatment facilities exceeded discharge permit requirements. The chemical quality of some surface and shallow ground waters is influenced by LASL effluents. The quality of the municipal water supply from the deep ground-water aquifer has not been affected by LASL operations and met all applicable standards. Results of several special studies provide understanding and documentation of certain unique environmental conditions in the LASL environs.

45316 (MLM—2515) **Annual environmental monitoring report: calender year 1977.** Farmer, B.M.; Carfagno, D.G. (Mound Facility, Miamisburg, Ohio (USA)). 25 Apr 1978. Contract EY-76-C-04-0053. 45p. Dep. NTIS, PC A03/MF A01.

The local environment surrounding Mound Facility was monitored for tritium and plutonium-238. The results are reported for calendar year 1977. The environmental parameters analyzed included air, water, foodstuffs, soil and silt. The average concentrations of plutonium-238 and tritium were within the applicable stringent standards for radioactive species adopted by the U.S. DOE. Mound Facility drinking water has been brought into compliance with the new EPA standard for tritium in community drinking water systems, and Mound has undertaken a program to achieve compliance for nine private wells adjacent to the Facility site. The program has partially achieved its objective by bringing Mound wells and some of the nine affected private wells in the vicinity of Mound Facility into compliance with the U.S. EPA standard and significantly reducing tritium concentration in the remaining wells. Data concerning nonradioactive species in air and water are also presented and compared to federal, state, and local standards, where applicable.

45317 (ORNL—5382) **Evaluation of models used for the assessment of radionuclide releases to the environment. Progress report, April 1976—December 1977.** Miller, C.W. (comp.). (Oak Ridge National Lab., Tenn. (USA)). Jun 1978. Contract W-7405-ENG-26. 188p. Dep. NTIS, PC A09/MF A01.

The purpose of this project is to evaluate environmental transport and dose calculational models employed in the assessment of the radiological impact of routine and accidental radioactive discharges. This includes the identification of these models, the evaluation of their conceptualization, simplifying assumptions, and data bases, the estimation of their uncertainties and, if possible, the recommendation of the models and parameters which are best suited to particular assessment situations. Where needs are identified, recommendations will also be made for further environmental and biomedical research.

45318 (INEL-tr—29) **Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976.** Riedel, H.; von Gadow, A.; Gesewsky, P. (Bundesgesundheitsamt, Neuherberg (Germany, F.R.). Inst. fuer Strahlenhygiene). May 1977. Translation of STH—3/77. 57p. Dep. NTIS, PC A04/MF A01.

Following the Chinese nuclear bomb test (September 26, 1976), actual values for iodine-131 in air and precipitation, on vegetation as well as in cows- and goats-milk were measured over a period of six weeks. The measurement techniques with an achieved detection sensitivity in the range of a few percent of the measured concentrations are described in detail. The following I-131 concentrations were found in the different media: Air : max 191 fCi/m^3, average value : 42.5 fCi/m^3; Precipitation : max 6.3 pCi/l, average value : 3.0 pCi/l; Grass : max 164 pCi/m^2, average value : 105 pCi/m^2; Cow's Milk : max 18.5 pCi/l, average value : 9.0 pCi/l; and Goat's Milk : max 26.9 pCi/l, average value : 14.9 pCi/l. With the additional assumption on a retention factor for washout of grass (20 percent) and an effective half-life of I-131 on grass (3.9 d and 5 d), the attempt was made to calculate from these data the deposition velocity of radioiodine on pasture and the transfer coefficients from air to grass and from grass to milk as well as from air to milk. On the basis of an effective half-life of 3.9 d, the following values for these parameters have been calculated: Deposition velocity: 0.15 to 1.4 cm/s, average value: 0.74 cm/s; Air-Grass: 1.6 x 10^3 - 8.3 x 10^3 Ci/m^2 : Ci/m^3, average value: 4.8 x 10^3 Ci/m^2 : Ci/m^3; Grass-Milk: 0.64 x 10^{-1} to 1.36 x 10^{-1} Ci/l : Ci/m^3, average value: 0.84 x 10^{-1} Ci/l : Ci/m^3 average value: 0.84 x 10^{-1} Ci/l : Ci/m^3; Air-Milk Transfer Factor (wet deposition): 53 to 804 Ci/l : Ci/m^3, average value: 544 Ci/l : Ci/m^3 . The concentration of I-131 in goats milk showed a higher value than in cows milk by a factor of 2 to 3. For the period of these six weeks, the radiation exposure to the thyroid was calculated: for an infant: 4 mrem; for an adult: 0.3 mrem, whereby the main contribution is due to the ingestion of fresh milk.

45319 (ORNL-tr—4543) **Design of an accurate calculation method for the settling of radioactive substances from the exhaust of nuclear plants due to precipitation.** Brenk, H.D.; Vogt, K.J. (Kernforschungszentrum Karlsruhe (Germany, F.R.)). [nd]. Translation by S.D. Blalock Jr. of German report JUL—1328, August 1976. 13p. Dep. NTIS, PC A02/MF A01.

In connection with a realistic calculation of soil contamination caused by the washout of radioactive nuclides from the waste air of nuclear installations, there arises the question of how to proceed, if, in view of the very time-consuming efforts required for the preparation of sufficiently secured statistics, dispersion-climatological data are available to a limited extent only, such as are required, e.g., for safety reports for nuclear power stations. To clarify this question a practicable procedure is presented, which, despite its simplified nature, permits a site-specific calculation of the washout, because it is based on the annual precipitation volumes for the individual sectors of the windrose available for about 80 stations of the German meteorological service. The site-independent data additionally required for calculating the washout are being specified. The simplified method of calculation is compared with procedures rquiring a larger amount of data. The divergencies resulting therefrom are discussed.

SITE RESOURCE AND USE STUDIES

45320 (NP—23191, pp 494-570) **Environmental economics.** Dec 1975.

In Environmental quality. The sixth annual report of the Council on Environmental Quality.

Some topics discussed are as follows: estimating damage and avoidance costs; abatement and transactions costs; cost projections; economic impacts on employment, inflation, government finances, foreign trade, and industries; and balancing costs and making decisions for energy facility siting. (HLW)

REGULATIONS

REFER ALSO TO CITATION(S) 44873, 44878, 45293, 45294

45321 (NP—23191, pp 626-664) **National Environmental Policy Act.** Dec 1975.

In Environmental quality. The sixth annual report of the Council on Environmental Quality.

Some topics discussed are as follows: evaluation of agency NEPA compliance; use of NEPA in decision making; legal developments; environmental impact statements; revenue sharing; state environmental impact statement requirements; and international developments. (HLW)

45322 (PB—274557) **Control of volatile organic emissions from solvent metal cleaning.** Bollinger, J.C.; Shumaker, J.L. (Environmental Protection Agency, Research Triangle Park, N.C. (USA). Office of Air Quality Planning and Standards). Nov 1977. 201p. (EPA/450/2—77/022; OAQPS—1.2-079). NTIS PC A10/MF A01.

This report provides the necessary guidance to control emissions of volatile organic compounds (VOC) from solvent metal cleaning operations. Emissions are characterized and reasonably available control technology (RACT) is defined for each of the three major categories of solvent metal cleaners: cold cleaners, open top vapor degreasers, and conveyorized degreasers. Information on the cost of control, environmental impact, and enforcement issues is also included.

ENVIRONMENTAL SCIENCES, TERRESTRIAL

CHEMICALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 45106, 45294, 45297, 45311, 45312, 45348, 45378

RADIOACTIVE MATERIALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 44302, 45314, 45316, 45317, 45324, 45359

SOIL

45323 (LA—7216-MS) **Sorption—desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris.** Wolfsberg, K. (Los Alamos Scientific Lab., N.Mex. (USA)). Apr 1978. Contract W-7405-ENG-36. 33p. Dep. NTIS, PC A03/MF A01.

Distribution coefficients were determined for sorption-desorption of radioactive tracers between Nevada Test Site alluvium and alluvial ground water. The order of increasing distribution coefficient by element is: Sb, Sr, U(VI), I, Ru, Nb, Ba, Cs, Co, Y, Ce, and Eu. Some distribution data were also obtained for bentonite. Volatile and refractory debris samples from nuclear tests in tuff, alluvium, and rhyolite were leached with ground water. Most leachable are the volatile species I, Mo, and Sb, which have condensed on chimney rubble. Comparison of the laboratory data with field measurements indicates that leaching is the main process responsible for the presence of radionuclides in water from the site of the underground nuclear test Cambric.

TERRESTRIAL ECOSYSTEMS AND FOOD CHAINS

REFER ALSO TO CITATION(S) 45315, 45318

SITE RESOURCE AND USE STUDIES

REFER ALSO TO CITATION(S) 44254, 44861, 45320

45324 (DOE/EIS—0018-D) **Draft environmental impact statement. Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico.** (Department of Energy, Washington, D.C. (USA)). May 1978. 397p. W.H. Pennington, Washington, DC.

This statement assesses the potential cumulative environmental impacts associated with current and continuing activities at the LASL site. This includes the adverse impacts from postulated accidents associated with the activities. Various effluents including radioactive ones are released to the environment. However, a continuing, comprehensive, monitoring program is carried out to assist in the control of hazardous effluents. Alternatives to current operation of LASL include: cessation or relocation of programs; continue activities as presently constituted; further limitation of adverse impacts by institutional or other improvements in various operations; and expansion of current activities. Liquid, gaseous, and solid wastes are generated as by-products of the laboratory operation. Liquid wastes include radioactively contaminated solutions, chemically contaminated wastes, sanitary sewage, cooling water discharges, and storm drainage. The ordinary sanitary liquid wastes are processed by conventional sewage treatment plants, lagoons, and septic tanks. Industrial liquid wastes are processed by special treatment plants to remove radioactive components and to detoxify or neutralize other chemical agents. The results of analyses of treated effluents released in 1976 are summarized. The treated effluents contain radioactive pollutants at levels of only a few percent of guidelines applicable to exposure to the public from ingestion of water and food.

45325 (PB—274031) **Massachusetts coastal zone management program. Volume I.** (Massachusetts Office of Coastal Zone Management, Boston (USA)). Mar 1977. 602p. NTIS PC A99/MF A01.

After the introduction of the Massachusetts Coastal Zone Management plan in the first chapter, Chapter II contains a description of the landward and seaward boundaries of the Massachusetts coastal zone and a summary of how the CZM policies apply to the areas and activities within these boundaries. Chapter III contains a series of sections presenting long-term state coastal policies on the resources of the coastal zone--the marine environment, visual access and quality, and coastal hazards; and the primary uses of the coastal zone--port and harbor development, recreation and physical access, and energy-related uses of the coastal zone. These statements of state policy will guide state programs and activities in coastal areas. Chapter IV is on management, and includes an in-depth analysis of coastal zone management under existing institutional and administrative structures. The central issue is how to implement broad coastal policies in moving from planning to action. Four appendices dealing with legal documents, federal participation, public participation, and coordination with existing plans are included.

REGULATIONS

REFER ALSO TO CITATION(S) 44141, 44142, 45293, 45321

ENVIRONMENTAL SCIENCES, AQUATIC

BASIC STUDIES

REFER ALSO TO CITATION(S) 45374

CHEMICALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 44177, 44178, 44180, 44184, 44776, 45293, 45294, 45295, 45296, 45297, 45299, 45300, 45303, 45311, 45312, 45313, 45315, 45324, 45358, 45378, 45409, 45410, 45413

45326 (AD-A—048334) **Fate and effects of oil pollutants in extremely cold marine environments. Annual report No. 5, 1 January—31 December 1977.** Atlas, R.M. (Louisville Univ., Ky. (USA). Dept. of Biology). 31 Dec 1977. Contract N00014-76-C-0400. 53p. NTIS PC A04/MF A01.

Petroleum degradation was studied using Prudhoe Bay crude oil incubated in situ in several Arctic ecosystems. Studies were conducted in water, ice and sediment ecosystems. No biodegradation of oil was found when oil was allowed to freeze into the ice matrix. When oil was spilled under ice evaporative losses were greatly restricted and biodegradation rates were very low. In sediment, biodegradative changes in the oil were found within a few days of spillage. When sediment was contaminated with oil there was extensive mortality of invertebrates. Recolonization of contaminated sediment occurred rapidly but recolonization was by different benthic invertebrate species than recolonized uncontaminated sediment.

45327 (ANL/WR—77-2) **Water resources research program. Pollution of coastal waters off Chicago by sinking plumes from the Indiana Harbor Canal.** Harrison, W.; McCown, D.L.; Raphaelian, L.A.; Saunders, K.D. (Argonne National Lab., Ill. (USA)). Dec 1977. Contract W-31-109-ENG-38. 138p. Dep. NTIS, PC A07/MF A01.

On March 2, 1977, during sinking-plume conditions, a portion of the water of the Indiana Harbor Canal (IHC) was injected with samarium and rhodamine-dye tags and a section of the IHC's surface was covered with simulated oily waste tagged with dysprosium. Water samples were taken downcurrent, over a 54-hr period, from a vessel and from the raw-water streams from the intakes at Chicago's South Water Filtration Plant (SWFP). Bottom currents and water temperatures were measured almost continuously at four Lake Michigan stations located between the IHC and the SWFP. Unequivocal evidence is presented for transport of the tagged IHC water and oily waste to the SWFP's intakes. Organic contaminants from the IHC were present in trace concentrations in the SWFP's raw water. A model for the transport and mixing of the entire IHC effluent, for the environmental conditions during the experiment, indicates a minimum dilution of 4 in the plume offshore of the SWFP and, for the assumed plume trajectory, values of 5×10^2 and 10^5 at the shore and crib intakes, respectively. A similar model applied to the experimental situation of tagged effluent showed reasonable agreement with measurements. Analysis of historical data indicates that the worst-case pollution event that might be experienced at the SWFP, assuming constant pollutant loading in the IHC, would be due to 24 hr of northwest wind followed by a 3.0-in. (7.6 cm), 24-hr rainfall that coincides with 3.0×10^6 m of total wind movement from the southerly quadrants.

45328 (CED—78-93) **Benefits derived from the Outer Continental Shelf environmental studies program are questionable.** Eschwege, H. (General Accounting Office, Washington, D.C. (USA)). 1 Jun 1978. 30p. General Accounting Office, Washington, DC.

The Outer Continental Shelf environmental studies program is costly, exceeding $200 million since its inception, and may accomplish little in minimizing environmental damage during oil and gas exploration, development, and production in the Outer Continental Shelf. There is little agreement among Federal and State agencies on how the environmental studies can best be used in the decision making process affecting development of the Outer Continental Shelf and what information is needed to assess the environmental impact of oil and gas development in the Outer Continental Shelf. These problems are compounded by the absence of coordinated Government-wide plans that adequately define the information

needs of Outer Continental Shelf managers and give direction and an approach to obtaining such information. The Outer Continental Shelf environmental studies program should be reassessed for how the studies can best be used in the decision making process, what information is needed, and what plans are necessary.

45329 (NP—23191, pp 571-625) **Global environment.** Dec 1975. In Environmental quality. The sixth annual report of the Council on Environmental Quality.

Some topics discussed are as follows: hunger in the modern world; causes of the food crisis; raising world food supplies; fertilizers; pest control; the UN food conference; population statistics; exploitation of marine resources; oil pollution of the ocean; and economic aspects of environmental policy in developed and developing countries. (HLW)

45330 (NTIS/PS—78/0039) **Water pollution analysis and detection. Volume 2. July 1974—December 1976 (a bibliography with abstracts). Report for July 1974—December 1976.** Cavagnaro, D.M. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 171p.

The cited studies cover water analysis techniques, including gas chromatography, mass spectroscopy, infrared spectroscopy, spot tests, potentiometry, and neutron activation analysis. Some studies are general. Others were undertaken to analyze pollutants from various media, such as fresh water, salt water, industrial waste streams, and sewage effluents. The pollutants include nutrients, dissolved gases, heavy metals, cyanides, pesticides, and other industrial wastes. (This updated bibliography contains 166 abstracts, none of which are new entries to the previous edition.)

45331 (NTIS/PS—78/0040) **Water pollution analysis and detection. Volume 3. 1977—January 1978 (a bibliography with abstracts). Report for 1977—January 1978.** Cavagnaro, D.M. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 182p.

This bibliography contains citations on water analysis techniques. Some of the techniques include mass spectroscopy, infrared spectroscopy, spot tests, potentiometry, gas chromatography, and neutron activation analysis. There are nutrients, dissolved gases, heavy metals, cyanides, pesticides, and other industrial wastes included in the pollutants. Some are general studies. Others were undertaken to analyze pollutants from various media, such as fresh water, salt water, industrial waste streams, and sewage effluents. Oil pollution detection and analysis is excluded. (This updated bibliography contains 177 abstracts, all of which are new entries to the previous edition.)

45332 (PB—275692) **Field investigations of convergences and slick concentration mechanisms in Delaware Bay. (Research on the effects of crude oil transfer and upstream refineries on Delaware Bay).** Sarabun, C.C. Jr. (Delaware Univ., Newark (USA). Coll. of Marine Studies). 1977. 81p. (CMS-RANN—1-77).

Field studies conducted in the channel north of the Delaware Bay lightering anchorage are discussed. Significant differences are found to exist between the winter-spring season when only a single front occurs, and the summer-fall when multiple, internal waves appear on a persistent near-surface pycnocline. Although the data are not conclusive, some effects of variation in river-flow can be seen.

45333 Weathering characteristics of petroleum hydrocarbons deposited in fine clay marine sediments, Searsport, Maine. Mayo, D.W. (Bowdoin Coll., Brunswick, ME); Page, D.S.; Cooley, J.; Sorenson, E.; Bradley, F.; Gilfillan, E.S.; Hanson, S.A. *J. Fish. Res. Board Can.;* **35**: No. 5, 552-562(May 1978).

Further examination of the 1971 spill site in Long Cove, Searsport, Maine, has been carried out during 1976, and has led to the following observations: 1. Petroleum residues isolated from this spill give the appearance of weathering particularly slowly in the cold anoxic sediments of Long Cove. 2. Leaching from contaminated terrestial sediments onto portions of the intertidal zone on the west shore of the Cove while continuing in trace concentrations does not appear to be making a major contribution to the maintenance of a nearly steady state pollution problem found in several areas of the Cove. 3. On the average, the spill area currently appears to contain roughly 20% less material than in 1971. At a number of sites, however, there appears to have been either little or no decline in gross hydrocarbon concentrations, and essentially no weathering of the aliphatic portions of the petroleum residues. 4. One of the principal factors to influence the character of petroleum residues isolated 5 yr postspill appears to have been the weathering of the hydrocarbons during transport to the site of sediment penetration from upland locations. Thus, the current compound distribution was determined early in the spill period. 5. Repopulation of the Cove by M. arenaria, which is proceeding very slowly, correlates directly with the gross concentration variations of petroleum hydrocarbons.

45334 Mechanical dispersal of oil stranded in the littoral zone. Owens, E.H. (Louisiana State Univ., Baton Rouge). *J. Fish. Res. Board Can.;* **35**: No. 5, 563-572(May 1978).

The natural weathering and dispersion of oil stranded in the littoral zone depend on the type and volume of the oil and on the amount of available energy. Energy inputs can be biological, chemical, mechanical, or thermal; however, the single most important input appears to be from mechanical energy (winds, waves, tides, water levels, and ice). The residence time or persistence of stranded oils increases as mechanical energy levels at the shoreline decrease. The primary inputs of mechanical energy at the shoreline are due to wave action, and energy levels vary depending on the wind regime, fetch areas, and local exposure of a section of coast. In cold or polar climates, energy levels at the shoreline are reduced by the presence of ice on the sea or an ice foot on the beach. This review of the concepts associated with littoral processes, in terms of the mechanical dispersal of stranded oil, provides the basis for estimation of the persistence of oil on shorelines.

45335 Contribution of chronic petroleum inputs to Narragansett Bay and Rhode Island Sound sediments. Van Vleet, E.S.; Quin, J.G. (Univ. of Rhode Island, Kingston). *J. Fish. Res. Board Can.;* **35**: No. 5, 536-543(May 1978).

Sediment cores from Narragansett Bay and Rhode Island Sound have been analyzed for petroleum hydrocarbons and compared with a relatively unpolluted sediment core from the Gulf of Maine. The sediments were analyzed for unbound hydrocarbons, hydrocarbons bound or closely associated with humic substances, and residual hydrocarbons bound or closely associated with the clay mineral or kerogen matrix. Results indicated that in general 90-100% of the hydrocarbons were in the unbound form and could be easily extracted with organic solvents. The petroleum hydrocarbons decreased with depth at all stations. Biogenic hydrocarbons (nC_{25}, nC_{27}, nC_{29}, and nC_{31}) made up an increasingly greater percentage of the total with increasing depth. The hydrocarbons in the Narragansett Bay sediments and near surface Rhode Island Sound sediments strongly resembled the hydrocarbons previously reported for the Providence River and upper Narragansett Bay. These petroleum-like hydrocarbons were shown to be largely introduced to the river and bay through chronic inputs from a municipal wastewater treatment plant. These hydrocarbons then undergo sedimentation throughout the entire bay and into Rhode Island Sound. Preliminary calculations indicate that over 0.2 million t (tonne) of petroleum hydrocarbons may be transported to the marine environment annually from municipal treatment plants. Most of these hydrocarbons appear to accumulate in estuarine and coastal sediments.

45336 Oxidation of ecologically relevant substances in effluents and water. Luessem, H. *Wasser, Luft Betr.;* **21**: No. 9, 489(Sep 1977). (In German).

Almost all waste products are converted naturally by oxidation into their basic mineral substances. In order to assess their relevance for the environment, it is essential to measure the total potential oxidizability and the rate of oxidation both in nature and in artificially controlled and accelerated cleaning processes.

45337 (UCRL-Trans—11369) **Relationship between content of copper in fish, plankton, and lake water.** Drbal, K. Translated from *Zivocisna Vyroba;* **21**: No. 12, 925-932(1976). 10p. Dep. NTIS, PC A02/MF A01.

In order to study the dynamics of copper in aquatic ecosystems 14 lakes were chosen in the Trebon, Vodnan and Klatov districts of Czechoslovakia. Three of these (Svet, Hnacov, Zahorsky) are recreational lakes. The lakes investigated have different characters. The Trebon and Klatov lakes mainly have a sandy bottom with more or less loamy particles. Stare Jezero sits on a peaty soil. The Vodnan lakes are similar in nature. Their sediment and substrates are formed by loamy particles. Statistical processing of the results was used to study the relationship between the content of copper in water, fish and phytoplankton. The average overall content of copper in carp and tench was used as the copper content in fish. A statistically significant relationship was found between the Cu content in water and in fish and between the Cu content in water and in plankton. It is surprising, however, that a relationship was not found between the content of copper in fish and in plankton, the latter being a component of the carp and tench diet.

45338 Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975). 360p. (CONF-731241—). $50.00.

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

The meeting was directed towards the attainment of a rational approach towards the control of heavy metals in the aquatic environment. Recognized scientists were gathered from all over the world in order to discuss their investigations and conclusions regarding their areas of expertise in heavy metals. The results are significant and timely. This "state of the art" document will aid all

countries in pursuing a rational approach to the control of heavy metals in the environment. Separate abstracts were entered for the individual items.

45339 Effects of heavy metals on fish and aquatic organisms. Katz, M. (Parametrix Inc., Seattle). pp 25-30 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Some topics discussed are as follows: maximum permissible concentration of heavy metals in water, collection of data for insuring that recommendations and the treatment facilities achieve an improvement in the environment which may justify the expenditure of time, funds, and energy; polluting effects of lead mines in Cardiganshire, Wales; effects of mining on the Miramichi river in Nova Scotia and on Atlantic salmon spawning in this river; effect of low concentrations of mercury, arsenic, lead, and selenium on conditioned responses of goldfish; correlation of fish diseases wih heavy metal pollution; cytological changes in gill epithelium of trout exposed to zinc; effects of zinc on morphology and growth of guppies; and toxicity of heavy metals to Daphnia, Gammarus, snails, may flies, and caddis flies. (HLW)

45340 Mercury concentrations in humans and consumption of fish containing methylmercury. Humphrey, H.E.B. (Michigan Dept. of Public Health, Lansing). pp 33 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Certain species of fish from Lake St. Clair contain a questionably toxic concentration of mercury, over 0.5 ppM. Accordingly, the relationship between whole blood total mercury concentrations and consumption of fish has been studied in this and another area of Michigan. Randomly sampled adult residents of Algonac who eat less than 6 lb of fish annually from the St. Clair River and Lake St. Clair (noneaters) were contrasted with residents eating 26 lb or more of such fish annually (eaters). These were compared with similarly defined noneaters and eaters in South Haven where Lake Michigan fish contain less than 0.5 ppM of mercury. Blood mercury levels for 65 Algonac noneaters averaged 5.7 ppB and ranged from 1.1 to 20.6 ppB. Comparative values for 42 South Haven noneaters were 5.2 ppB and 1.6 to 11.5 ppB, respectively. Mercury levels for persons who ate fish were higher in both communities. Blood mercury levels for 42 Algonac fish eaters averaged 36.4 ppB and ranged from 3.0 to 95.6 ppB. Comparative levels for 54 eaters from South Haven were lower, averaging 11.8 ppB and ranging from 3.7 to 44.6 ppB. The data show that a direct relationship between the quantity of fish consumed and the concentration of mercury observed in human blood exists. Preliminary tests for methylmercury in the same human blood samples indicate that relationships similar to those observed for total mercury occur. Eating of sport fish from the St. Clair waters apparently leads to some absorption of methylmercury, albeit at lower than known toxic levels.

45341 Methylmercury analysis (a review and some data). Sumino, K. (Kobe Univ., Japan). pp 35-45 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The development of minamata disease in Japan following exposure to methylmercury is discussed. Analytical methods for measuring methylmercury are discussed with regard to extraction, estimation, precision, accuracy, and tentative method for determining methylmercury in bottom mud. Application data are discussed with regard to the amounts of total mercury and methylmercury in bodies of Japanese; biological half-life of methylmercury in rat organs; and chemical reaction of Hg^{2+} with methyl cobalamine. (HLW)

45342 Analytical techniques for heavy metals other than mercury. Laitinen, H.A. (Univ. of Illinois, Urbana). pp 73-84 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The factors entering into the choice of analytical techniques for heavy metals in environmental samples are considered. Detailed principles are not discussed. General considerations are reviewed and various analytical techniques are compared. These include chemical methods based on reactions in solution; spectrophotometric procedures; electrochemical techniques; neutron activation analysis; mass spectrometry; x-ray emission analysis; and gas chromatography.

45343 Field observations on the transport of heavy metals in sediments. DeGroot, A.J. (Inst. for Soil Fertility, Haren, Netherlands); Allersma, E. pp 85-95 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

In addition to their natural content of heavy metals, sediments transported by some rivers carry large amounts of these elements resulting from pollution. The distribution of these elements between the suspended matter and the surrounding water, upstream with respect to the estuary, indicates for a number of elements a preferred adsorption to the solid phase. The composition of the fine-grained material from the rivers influencing the Netherlands delta (mainly the Rhine) is described, as well as that from some tropical river systems. Under temperate climatic conditions the sediments on their way to the sea can undergo changes in their metal composition by mobilization of these elements as soluble metal-organic complexes. These processes lead to less-contaminated sediments in the lower courses of the delta. Special attention is paid to the influence of civil engineering projects (enclosure of river outlets) on these processes. Finally, a treatise is given on the pollution with heavy metals of the diverse types of suspended matter. Dependent on the velocity of the river currents, different types of suspended matter are transported. These types differ in their sedimentation characteristics. It appears that those constituents, which have been contaminated in the most severe way, have the most widespread distribution in the aquatic environment.

45344 Sorption phenomenon in the organics of bottom sediments. Reimers, R.S. (Battelle Columbus Labs., OH); Krenkel, P.A.; Eagle, M.; Tragitt, G. pp 117-129 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Using principles obtained from the chemistry of mercury, the literature on mercury sorption on organics and the results of the sorption experimentation described earlier, an attempt has been made to analyze and compare the sorption characteristics of mercury in synthetic and natural organic sediments. Polyethylene-nylon films, sands, and gravel inhibited the aqueous transfer of mercury to fish in aquarium studies. Since these materials have a low capacity for inorganic mercury and almost none for methylmercury, the inhibition mechanism must not be sorption or binding but stabilization of the colloidal sediment by reduction of sediment agitation. At a constant pH, the only synthetic organic sediments which were affected by chlorides were the alkanes and organic acids. They reduced in their capacitance for mercuric chloride with increased chlorides. The effects of pH on the attraction of mercuric chloride to the organic sediments studied were varied. The amines and the mercaptans tended to adsorb more at pHs of 5 and 9 while the alkanes and alkyl acids appeared to be unaffected by pH changes. As the pH was increased, the humate organics did not release mercury; however, they became water soluble, thus releasing a soluble mercury-humate complex with methylmercury. Adsorption of methylmercury by sulfur-containing organic sediments was also unaffected by pH fluctuations. When inorganic or organic mercury was adsorbed by sediment organics, the desorption was observed to be negligible.

45345 Role of hydrous metal oxides in the transport of heavy metals in the environment. Lee, G.F. (Univ. of Texas, Dallas). pp 137-147 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The uptake and release of heavy metals is influenced by the pH of the solution and by the presence of organic and inorganic complexes. Further, one should not judge the potential role of heavy metals in influencing the aqueous environmental chemistry of copper, zinc, nickel, cadmium, etc. based on the concentration of iron and manganese in the solution. Often hydrous metal oxide sorption activity is far in excess of what would be predicted, based on their concentrations as a result of their occurring on the surfaces of various types of mineral and detrital particles. This situation is further complicated by the fact that the reactions between the hydrous metal oxides and the heavy metals are often nonstoichiometric. Also, many of these reactions are not reversible. This makes simple solution equilibria and the simple chemical kinetic approach essentially nonapplicable to the systems. The system is further complicated by the fact that the hydrous metal oxides would not be

expected to show constant characteristics as a function of the age of the oxide. A freshly precipitated oxide, such as ferric hydroxide or manganese dioxide, would likely have markedly different sorption characteristics than aged oxides or hydroxides. Further, in the presence of natural waters, it is possible that the natural water organic matter could play a significant role in uptake and release of heavy metals on hydrous oxide coatings or discrete particles. While there is no doubt that hydrous metal oxides are important sinks and modes of transport for heavy metals in the environment, the quantitative magnitude of this role is not known for a variety of natural water conditions. As greater emphasis is placed on the control of heavy metals in the environment by water pollution control regulatory agencies, a much better understanding of the interactions between heavy metals and hydrous metal oxides must be available in order to affect technically sound and economically feasible control programs.

45346 Transport and biological effects of molybdenum in the environment. Chappell, W.R. (Univ. of Colorado, Boulder). pp 167-188 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The following topics are discussed: distribution of Mo in nature; release into the environment from mining and milling, processing of ore, mining and milling of uranium and copper ores, and burning of fossil fuels; aqueous transport of Mo; transport from irrigation water to plants; role of Mo in stimulating nitrogen fixation and nitrate reduction in plants; Mo as a cofactor for enzymes; toxic effects on Cu metabolism in animals; symptoms of Mo toxicity in various species of animals; effects of supplementing diet with Cu and various levels of Mo on animals fed a Cu-deficient diet; effects of molybdate in water on rats that were cold stressed; effects of Mo toxicity on bone metabolism; similarity of roles of Mo and Se in nature. (HLW)

45347 Biological and nonbiological transformations of mercury in aquatic systems. Iverson, W.P.; Huey, C.; Brinckman, F.E.; Jewett, K.L.; Blair, W. (National Bureau of Standards, Washington, DC). pp 193-195 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

A number of mercury-tolerant bacterial isolates from Chesapeake Bay waters and sediments have been examined for their ability to volatilize mercury from trace concentrations of inorganic or organomercury compounds (e.g. $HgCl_2$ or phenylmercuric acetate). A survey for such aerobic microorganisms has been conducted; these include Pseudomonas spp. which constitute about 90% of the phenylmercuric acetate-tolerant bacterial cultures obtained. Inoculated agar plates containing phenylmercuric acetate (0.3 ppM) were placed in a bioreactor and the atmosphere surrounding the plates analyzed for total and metallic mercury using an atomic absorption (AA) spectrophotometer on-line with a bioreactor. The results indicated that all of the nine isolates so examined primarily produce metallic mercury.

45348 Distribution of mercury in fish and its form of occurrence. Doi, R. (Tokyo Metropolitan Research Inst. for Environmental Protection); Ui, J. pp 197-221 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The following topics are discussed: mercury pollution in Japan; mercury content analysis of biological specimens; recent aspects in relation to mercury contamination of fish; present state of mercury accumulation in the Japanese population; health hazards in relation to mercury accumulation in the Japanese population; role of wild and domestic animals as indices of ill effect following mercury accumulation in fish; PCB, DDT, and other organochloride residues; and present aspects of mercury related environmental pollution in Japan and government countermeasures. (HLW)

45349 Investigations of heavy metals and other persistent chemicals, Westernport Bay, Australia. Shapiro, M.A. (Univ. of Pittsburgh); Connell, D.W. pp 247-250 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

In certain estuaries in Australia, uch as the Derwent and Tamar in Tasmania, evidence of abnormally high concentrations of zinc, copper, and cadmium were found in oysters growing in these bodies of water. A recent report by Thrower and Eustace indicates concentrations of zinc as high as 21,000 ppM, cadmium 63 ppM, and copper 450 ppM wet weight. The tragedy in this instance is that the Pacific oyster, Crassostrea gigas Thunberg, was introduced into Tasmania from Japan in the late 1940s and proved so successful that commercial leases to grow this oyster were set up in the Tamar river. No such beds exist in Westernport Bay. However, the bay does contain a remarkable variety of fish and other aquatic organism. The rationale for the studies and investigations briefly described is that obtaining as much basic knowledge about these organisms and their relationships to environmental factors as possible will permit a more rational strategy for planning and development of the catchment, land use, water use, and environmental control.

45350 Mercury distribution in the Chesapeake Bay. Brinckman, F.E.; Jewett, K.L.; Blair, W.R.; Iverson, W.P.; Huey, C. pp 251-252 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Water, plankton, and sediment samples were taken at a number of Chesapeake Bay sites which were selected for their accessibility, exposure to technological effluents and availability of biological data. Sediment samples (grab and gravity cores) were frozen to -80°C as soon as they were obtained. The samples were analyzed for total mercury using flameless atomic absorption techniques (EPA Provisional Method for Mercury in Sediment and Water, January 1972). The values obtained were determined from standard curves constructed by least square fits. Redox potential, pH, and total sulfide ion activity measurements were made at 10 cm depth intervals, on portions of the fresh core samples, alternate to those portions removed and frozen for mercury analysis. Most of the data on the core samples is in the process of evaluation, and the mercury, as well as other heavy metal, concentrations in frozen core samples from the entire Chesapeake Bay still await determination. The results of a preliminary survey of the sediments from the upper portion of the Bay are shown.

45351 Physical-chemical methods of heavy metals removal. Patterson, J.W. (Illinois Inst. of Tech., Chicago); Minear, R.A. pp 261-272 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Processes available for metals treatment are examined with regard to levels of treatment being accomplished and at what cost. The following processes are described: precipitation; ion exchange; reverse osmosis; evaporation. Other processes considered are ion flotation, liquid-liquid extraction, freeze concentration, activated carbon adsorption, electrolysis, and cementation. Efficiencies of precipitation processes are discussed; reasons for variations in efficiencies are nature of the metals to be removed, pretreatment required, volume of waste flow, strength of waste, and cost and availability of treatment chemicals. Other topics discussed are sludge preparation and handling and economic considerations. (HLW)

45352 Effects and removal of heavy metals in biological treatment. Adams, C.E. Jr.; Eckenfelder, W.W. Jr.; Goodman, B.L. (Associated Water and Air Resources Engineers Inc., Nashville). pp 277-292 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

From reviewing the data of the various studies with individual and combined heavy metals, it appears that essentially all of the heavy metals exhibited the same relative effects on the activated sludge process. In the low concentration ranges, i.e., less than 10 mg/l, there is apparently an increasing deterioration of effluent quality with increasing heavy metal concentration. The efficiency of the activated sludge process seems to be reduced approximately 3 to 10% at these heavy metals concentrations. Increasing the concentration of heavy metals above these lower levels does not appear to result in any significant additional deterioration of effluent quality. Obviously, there may be some high level concentration of heavy metal at which the activated sludge system would fail completely. However, it appears that this concentration is many order of magnitudes larger than the low levels which cause the initial deterioration in effluent quality, and it also seems that there is not an increasing deterioration of effluent quality with increasing metal concentration up to the threshold failure concentration. A summary of the heavy metals concentrations which resulted in significant effects on the effluent quality from the activated sludge process is given. It appears that there will be a deterioration of effluent quality at certain low heavy metal concentrations above which no increasing deterioration will be observed. The metals tend to form organic-metallic complex-

es at low concentrations with cetain essential extracellular constituents, thereby inhibiting normal biological activities. These complexes absorb onto the biological flocs and are partially removed from solution along with precipitated metallic ions. A significant portion of the metals can be expected to be removed through the treatment process depending on the heavy metal and the conditions of operation of the treatment facility, such as waste strength, pH, and concentration of microorganisms.

45353 Feasibility of restoring mercury-contaminated waters. Jerneloev, A.; Asell, B. (Swedish Water and Air Pollution Research Lab., Stockholm). pp 299-309 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The simulations performed, in order to indicate how different restoration methods affect methylmercury concentrations in biota, can be considered a kind of sensitivity analysis of the constructed model. In order to judge the significance of the simulation results, one must accept the hypothesis that there is a definite possibility that the corresponding alterations can be achieved in a natural system. In other words, if we believe that it is possible to, e.g., achieve a 95% decrease in the methylation rate by covering the sediment of a lake, then the corresponding simulation has an indicative value, specifying the best method to be chosen in a practical case. Many questions still remain unanswered concerning the practical use of different restoration methods. Nevertheless, it seems possible to affect the biochemical availability of mercury to a much larger extent than in the simulation, especially under anaerobic conditions. The effects of sediment covering on methylation rate have also been demonstrated to be high, at least in a limited-time perspective. It seems that the removal of mercury by means of dredging must be quite efficient in order to have a significant effect on the methylmercury concentrations in biota. However, the simulations showed that restoration operations in general would have little effect if they were limited to only a part of a water system, even if that part contained, as in this case, the main amount (90%) of the mercury in the system.

45354 Experience with heavy metals in the Tennessee Valley Authority system. Nicholas, W.R.; Brye, B.A. pp 315-328 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

A review is given of the development of water resources of the Tennessee River Valley by the TVA. The Boone Reservoir fish-kill of 1968 is discussed with regard to possible causes of the kill, plankton studies, initial bioassays, water quality observations, and the drum removal program. In 1970 the TVA began checking mercury levels in fish, water, and sediment samples from its impoundments and streams. The flesh of fish from Pickwick Reservoir and the Holston River contained mercury in amounts exceeding the FDA guideline. Since 1970 the problem areas have been kept under continued surveillance. Data on distribution of mercury in bottom sediments of Pickwick Reservoir were compiled; dredge and core samples and tables are presented to show results. Analyses for other heavy metals in fish, water, and sediments were also made. (HLW)

45355 Use of synthetic scavengers for the binding of heavy metals. Feick, G.; Johanson, E.E.; Yeaple, D.S. (JBF Scientific Corp., Burlington, MA). pp 329-332 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Much of the recent work on heavy-metal contamination of water bodies is concerned with the environmental effects of mercury. Because of its extreme toxicity, its widespread use, and its ease of detection in trace quantities, mercury provides an ideal subject for study. One feature of mercury chemistry which is absent with most other heavy metals is its biological methylation into compounds which are more toxic than the mercuric ion itself. The work on which the present paper is based was directed mainly toward the restoration of mercury-contaminated water bodies by the application of chemical binding agents or scavengers, which hold the mercury in insoluble form in the bottom sediments and keep it out of the water column. An additional feature of some of these scavengers is that the insoluble forms of mercury (e.g., mercuric sulfide) may be less subject to biological methylation than the more soluble mercury species. These scavengers may also be useful for binding other heavy metals.

45356 Current regulations and enforcement experience by the environmental protection agency. Schafer, C.J.; Strier, M.P. (Environmental Protection Agency, Washington, DC). pp 335-338 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

In summary, NPDES (National Pollutant Discharge Elimination System) permits are required for point source discharges to the waters of the United States, and will contain effluent limitations, schedules of compliance, and monitoring requirements. Permits may be based on water quality requirements or best practicable control technology currently available, defined on the basis of engineering judgment until formal Effluent Guidelines are issued, but by the Effluent Guidelines for those parameters specified in the guidelines after they are issued. Such guidelines for the various industries are being proposed by the Environmental Protection Agency for public comment. The waste treatment practices for the Electroplating Industry, a major source of heavy metals discharge, has been discussed in general. Waste treatment practices for this industry such as chemical precipitation, integrated treatment, ion exchange, and evaporative recovery have been indicated as being useful for meeting effluent limitations at least for 1977. Any practice requiring minimal water use and maximum recovery of materials is in best keeping with the true spirit of the law.

45357 Risk—benefit analysis and the economics of heavy metals control. Provenzano, G. (Univ. of Illinois, Urbana). pp 339-346 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Some topics discussed are as follows: economic benefits from the use of heavy metals; generation of waste materials containing heavy metals and heavy metal compounds; toxic effects of heavy metal wastes on living organisms; categories of benefit-risk decision making; intensive use of lead as an industrial metal; and methods for estimating benefit-risk and benefit-cost. (HLW)

RADIOACTIVE MATERIALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 44301, 45316, 45317, 45324

45358 (PB—276014) **Project development and technical development plan. New York Bight Project.** (Science Applications, Inc., La Jolla, Calif. (USA)). Jul 1977. Contract NOAA-03-7-022-35105. 229p. NTIS PC A11/MF A01.

The Marine EcoSystems Analysis (MESA) Project Development Plan has been jointly prepared by the MESA Program Office and the New York Bight Project Staff and represents the overall plan for project implementation. The plan describes a systematic approach to achieving specifically identified goals and objectives that have been delegated to the Department of Commerce for protection of the marine environment. The overall goals of the Project are to develop a comprehensive understanding of the processes and interrelationships of the ecosystem and to determine the fate and effects of pollutants and other man-related stresses on the New York Bight. More specific goals include planning for future actions such as monitoring of the Bight, oil and gas development, offshore nuclear power generation, and the development of alternatives to existing waste disposal strategies.

45359 (BNWL-tr—268) **Geosphere model: description, opinions, and input requirements.** Grundfelt, B. (Kemakta Konsult AB (Sweden)). 30 Sep 1977. Translation of KBS-TR—10. 39p. Dep. NTIS, PC A03/MF A01.

The Geosphere computer model described is used to compute the amount of radioactivity released per year (the release rate) to a receiver from a repository in a geologic formation through which ground water is flowing. The release rate is computed as a function of time, so that a chromatographic spectrum is obtained. In its present state, the program evaluates 56 radionuclides that may be present in reactor effluents or naturally occurring in rocks. The output, in the form of chromatographic spectra, obtained from the Geosphere model is stored in a data file in such a way that the file can be used directly as input for the Biosphere model.

WATER

REFER ALSO TO CITATION(S) 45323

AQUATIC ECOSYSTEMS AND FOOD CHAINS

REFER ALSO TO CITATION(S) 45315

THERMAL EFFLUENTS MONITORING AND TRANSPORT

45360 (ANL/WR—77-3) **Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes.** Paddock, R.A.; Frigo, A.A.; Ditmars, J.D. (Argonne National Lab., Ill. (USA)). Jul 1977. Contract W-31-109-ENG-38. 55p. Dep. NTIS, PC A04/MF A01.

Measurements were made of the thermal plumes from the two submerged discharges of the Zion plant into Lake Michigan during the summer of 1976. The survey results are reported in the form of horizontal isotherm maps at vertical intervals of 1.0 m, from the surface to a depth of 3.0 m, and of selected vertical cross sections. Ambient lake-water temperatures and currents were monitored throughout the study period. Analysis of data from two mappings of double plumes made in 1975 by Argonne at this site had indicated that significant interaction between the plumes from the adjacent discharges occurred in the presence of an ambient current. The interaction resulted in surface areas of the double plumes that were more than ten times the sum of two separate, single-discharge plumes. Comparisons of the results of the present surveys with the previous mappings are limited somewhat because of the difficulties in defining the ambient, or background, water temperature. Temperature data collected in the 1976 surveys exhibited large spatial and temporal variability. Vertical temperature stratification during one of these surveys resulted in entrainment of cooler near-bottom water, greatly reducing plume surface temperatures; and intrusion of a cool-water mass into the site area during the other survey made it possible to define only a range of ambient temperatures. The conclusions from the analysis of the additional double-plume data, constrained by the variability cited above, are that the surface isotherm areas associated with the downcurrent, shielded plume were larger than those of a single plume discharged in the same direction, and that the total double-plume surface isotherm area in one survey appears to exceed that of the sum of two separate, single-discharge plumes.

45361 (PB—273580) **Supplement to effects of thermal discharges on physico-chemical processes and water quality, Vistula River, Poland. Final report, January 1973—December 1975.** Dojlido, J.R. (Institute of Meteorology and Water Management, Warsaw (Poland)). Nov 1977. 162p. NTIS PC A08/MF A01.

The study on the influence of thermal water discharge from the open cooling system of the Kozienice power plant on the thermal regimes and water quality of the Vistula River was carried out in the period from January 1973 to December 1975. Studies carried out downstream of the plant included: (1) Expedition type of survey; the temperature and velocity distributions in chosen cross-sections of the river and in the outlet channel were done; (2) periodical type of survey. The temperature and velocity distribution in the cross-section 1000 m downstream of the discharge and in the outlet channel; (3) everyday observations of the temperature in the three cross-sections, at three points. This report contains basic data collected in these studies and a section on Precision of Analytical Methods.

SITE RESOURCE AND USE STUDIES

REFER ALSO TO CITATION(S) 44622, 44854, 44862, 45325

45362 (PB—274565) **Alternatives for hazardous waste management in the inorganic chemicals industry. Final report, September 1976—January 1977.** Abrams, E.F.; Contos, G.; Drabkin, M. (Versar, Inc., Springfield, Va. (USA)). 3 Jun 1977. Contract EPA-68-01-4190. 303p. NTIS PC A14/MF A01.

The overall objective of this study was to assess the alternatives to land disposal for treatment and disposal of potentially hazardous wastes generated by the inorganic chemicals industry. The aim of this project was to identify promising resource recovery and detoxification oriented treatment techniques which are applicable to these wastes. This study provides: (1) Information on feasible alternatives to current inadequate disposal methods; (2) Data needed by industry in its effort to deal with increasing volumes of hazardous solid waste; (3) Information on RandD needs for treatment processes showing high potential for improved waste management. The technical effort was accomplished in three main tasks: Information gathering, consultation and process selection; Information analysis, costing and reporting; Comparison studies.

REGULATIONS

REFER ALSO TO CITATION(S) 44622, 44860, 45321, 45322, 45356

ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

SOCIAL AND ECONOMIC STUDIES

REFER ALSO TO CITATION(S) 44088, 44645, 44963

45363 (PB—274107) **Appalachian mineral resource development: environmental factors. Executive summary.** Gage, S.J. (Mitre Corp., McLean, Va. (USA). METREK Div.). Jul 1977. Contract EPA-68-01-3188. 17p. NTIS PC A02/MF A01.

Contents include: Mining and processing impacts on water; Extraction and processing impacts on air; Increased mineral production in Appalachia; Internalization of total costs. (Color illustrations reproduced in black and white)

45364 (PB—276171) **Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume III. ferrous smelting and refining. Final report, May 1974—April 1977.** Leonard, R.P.; Ziegler, R.C.; Brown, W.R.; Yang, J.Y.; Reif, H.G. (Calspan Corp., Buffalo, N.Y. (USA)). Apr 1977. Contract EPA-68-01-2604. 159p.

This volume presents the results of studies of the U.S. ferrous smelting and refining industry including iron and steel (SIC 3312), iron and steel foundries (SIC 332), ferroalloys (SIC 3313), and primary metal products not elsewhere classified (SIC 3399). Land-disposed or stored residuals, including slags, dusts, and sludges, have been identified and characterized by physical and chemical properties. State, regional and national estimates have been made of the total quantities of land-disposed or stored residuals and potentially hazardous constituents thereof. Current methods employed by the ferrous metals industry for the disposal or storage of process and pollution control residuals on land are described. Principal methods include lagoon storage of sludges, and open dumping of slags, sludges and dusts. Methods of residual treatment and disposal considered suitable for adequate health and environmental protection have been provided. Finally, the costs incurred by typical plants in each smelting and refining category for current and environmentally sound residual disposal or storage on land have been estimated.

45365 (PB—276172) **Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume IV. Appendices. Final report, May 1974—April 1977.** Leonard, R.P.; Ziegler, R.C.; Brown, W.R.; Yang, J.Y.; Reif, H.G. (Calspan Corp., Buffalo, N.Y. (USA)). Apr 1977. Contract EPA-68-01-2604. 64p.

Chemical analyses of residuals from metal smelting and refining; Solubility tests and other criteria for hazardous waste assessment; Costs and cost factors for treatment and disposal technologies; Procedures for calculating waste quantities for the iron and steel industry.

ASSESSMENT OF ENERGY TECHNOLOGIES

REFER ALSO TO CITATION(S) 44854

ENVIRONMENTAL IMPACT STATEMENTS

REFER ALSO TO CITATION(S) 44330

BIOMEDICAL SCIENCES, BASIC STUDIES

BEHAVIORAL BIOLOGY

45366 (ORNL-tr—4618) **Fatal flights of birds against windows.** Moerzer Bruijns, N.F.; Stwerka, L.J. Translated by S.D. Blalock Jr. from *Levende Nat.;* No. 64, 253-257(1961). 5p. Dep. NTIS, PC A02/MF A01.

Almost without exception the death flight against the glass is to be attributed to the circumstance that there are situations which give the birds the impression that they can fly through the area. This is easy to understand in connection with glass windshields with large panes, and also with small buildings in a series, consisting largely of glass. Flying against buildings occurs especially where there are greenhouses or bay windows with large frames not divided by framework and behind which there are no curtains or drapes. Many birds are also misled when there are large windows in two opposite

walls, so that it is possible to see through the room. This also happens when the windows are arranged in such a way that they make it possible to see through an angle. Open doors and windows sticking out also exact their toll. From the pattern of flight we get the impression that the birds want to fly through the interior just as they fly through a garden in an open space beneath the crown of a large tree. Many bird lovers have wondered whether there is any possibility of doing anything to prevent this death flight.

BIOCHEMISTRY

REFER ALSO TO CITATION(S) 45371, 45375, 45419

45367 (UCLA—12-1145) **Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3':5'-cyclic monophosphate levels in primary cultures of glia.** McCarthy, K.D.; de Vellis, J. (California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology). 1978. Contract EY-76-C-03-0012. 12p. Dep. NTIS, PC A02/MF A01.

Beta-adrenergic agonists, adenosine and prostaglandin E_1 increased the level of adenosine 3' : 5'-monophosphate (cAMP) in glial cultures prepared from rat cerebral cortical tissue. In addition to these physiological effectors, cholera toxin also increased cAMP levels in these cultures. The accumulation of cAMP in response to each of these agents, including cholera toxin, was partially blocked (50—80%) by simultaneous α-adrenergic receptor stimulation. Basal levels of cAMP were not affected by α-adrenergic agonists. These results indicate that in glia, α-adrenergic receptors may serve to modulate the level of cAMP which normally accumulates in response to a number of neurohumoral substances. The modulatory effect of α-adrenergic agents does not appear to reduce cAMP accumulation by activating a phosphodiesterase since the effect was not blocked by a potent inhibitor of this enzyme. The results suggest that the modulatory effect of α-adrenergic receptor activation results from an interaction which takes place at some point in between adenylate cyclase-associated-membrane receptors and the enzymatic degradation of cAMP.

45368 Isolation and characterization of two threonine-poor apolipoproteins of human plasma high density lipoproteins. Shore, V.G. (Univ. of California, Livermore); Shore, B.; Lewis, S.B. *Biochemistry;* **17**: No. 11, 2174-2179(30 May 1978).

Two apolipoproteins that are minor components normally of human plasma lipoproteins were discovered. They comprise up to 25% or more of the apolipoproteins in high density lipoproteins of some individuals with lipoprotein abnormalities associated with certain metabolic diseases and in individuals treated with amphotericin B for coccidiomycosis infection. The new apolipoproteins are distinctly different in amino acid composition, isoelectric point, and electrophoretic mobility from other known apolipoproteins. The new apolipoproteins are similar in amino acid composition. Both are unusually low in threonine, poor in valine and leucine, and rich in aspartic acid, glycine, alanine, and phenylalanine. They are relatively rich in arginine, although not as rich as the arginine-rich apolipoprotein, and have higher isoelectric points than other apolipoproteins except apoC-I. The more abundant of the two new apolipoproteins, of pI approximately 6.5, exists mainly as a dimeric protein of about 40 000 daltons and is dissociated by mercaptoethanol in the presence of sodium dodecyl sulfate. The less abundant one, of pI approximately 6.0, appears to be about 10 000 daltons. The threonine-poor apolipoproteins are associated mainly with plasma high density lipoproteins, particularly the denser HDL_3 subfraction, but small amounts were found in the very low and intermediate density lipoproteins. The HDL_3 with high content of threonine-poor apolipoproteins were indistinguishable from the normal HDL_3 by agarose or large pore polyacrylamide gel electrophoresis or by analytical ultracentrifugation. The lipid moiety of the abnormal HDL was richer in triglycerides and similar in phospholipid content to that of normal HDL.

TRACER TECHNIQUES

REFER ALSO TO CITATION(S) 45372

CYTOLOGY

45369 (CONF-780445—1) **Electron microscopy: a tool for visualizing chromatin.** Olins, A.L. (Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences; Oak Ridge National Lab., Tenn. (USA)). 1978. Contract W-7405-ENG-26. 19p. NTIS MF A01.

From NATO course on chromatin; Sicily, Italy (12 Apr 1978).

Portions of document are illegible.

The molecular biologist is fortunate that many of the macromolecules of interest can be visualized by the electron microscope, thus helping in the interpretation of biophysical and biochemical information. The problem arises in finding objective criteria for evaluating such images; gleaning the meaningful information and discarding the chaff. It is the goal of this article to set forth such guidelines to sharpen the student's awareness of the characteristics of acceptable electron microscopic data. The evaluation of a micrograph, as other biophysical data, can and should be objective and not based on artistic merit. Progress in our understanding of chromatin structure has been accelerated by electron microscopy and will serve as an example for this discussion.

45370 (CONF-780445—2) **Important hydrodynamic and spectroscopic techniques in the field of chromatin structure.** Olins, D.E. (Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences; Oak Ridge National Lab., Tenn. (USA)). 1978. Contract W-7405-ENG-26. 17p. Dep. NTIS, PC A02/MF A01.

From NATO course on chromatin; Sicily, Italy (12 Apr 1978).

Combining hydrodynamic and spectroscopic techniques in the study of conformational states of ν_1 induced by a variety of perturbants has led us to a general coneption: the two structural domains of ν_1 (i.e., the DNA-rich outer shell and the α-helix-rich apolar histone core) exhibit differential responsiveness. In general, the α-helical regions are more resistant, than DNA conformation or ν_1 size and shape, to the perturbing effects of urea, decreased ionic strength and pH, trypsin treatment, or a variety of water-miscible organic solvents. There are a number of reasonable conceptual models to explain this differential responsiveness of the structural domains of ν_1.

45371 (UCLA—12-1144) **Hormonal effects on differentiation in neutral cultures.** de Vellis, J.; McGinnis, J.F.; Breen, G.A.M.; Leveille, P.; Bennett, K.; McCarthy, K. (California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology). 1977. Contract EY-76-C-03-0012. 51p. Dep. NTIS, MF A01.

Portions of document are illegible.

The data presented clearly demonstrate that the induction of glycerol phosphate dehydrogenase (GPDH) by cortisol in C6 cells is due to an increased rate of synthesis without alteration of the rate of degradation of the enzyme, thus resulting in a greater number of molecules. Similarly, we have shown by immunotitration, Ouchterlony double diffusion, gel permeation chromatography, pH optimun, heat lability and polyacrylamide gel electrophoresis that GPDH in the brains of normal (induced) and hypophysectomized (uninduced) rats is identical. Thus in vivo as in cell culture, the hormonal regulation of GPDH activity is brought about by a change in the number of molecules, not in their catalytic efficiency. Similar questions now arise about the mRNA for GPDH, i.e., the influence of hydrocortisone on its rate of synthesis and degradation and efficiency of its translation. Since brain GPDH is identical to the enzyme present in muscle and liver, the mechanism for the specificity of the induction is an intrinsic property of brain tissue rather than related to the enzyme itself such as the coding by different structural genes.

TRACER TECHNIQUES

45372 18 μm replication units of chromosomal DNA fibers of differentiated cells of pea (Pisum sativum). Van't Hof, J.; Bjerknes, C.A. (Brookhaven National Lab., Upton, NY). *Chromosoma;* **64**: 287-294(1977).

Explants of stelar and cortical mature pea root tissues were cultured on solid agar synthetic medium for up to 6d. On the 3rd and 6th day the tissue was pulsed with ^{3}H-thymidine from 15 up to 180 min to label the DNA. Subsequently the nuclei were isolated, lysed, and the DNA spread on microscope slides. The autoradiograms of labeled DNA fibers showed that the average replication fork traveled at 9 μm/h, and that an average of 18 μm of DNA separated activated origins. Nearly identical parameters were obtained from DNA of all callus independent of tissue source and independent of the presence or absence of kinetin in the medium.

GENETICS

45373 Chromosomal translocation causing overproduction of iso-2-cytochrome c in yeast. Sherman, F.; Helms, C. (Univ. of Rochester, NY). *Genetics;* **88**: No. 4, 689-707(Apr 1978).

The CYC7-1 mutation in the yeast Saccharomyces cerevisiae causes the production of approximately 30 times the normal amount of iso-2-cytochrome c. Genetic analysis established that the CYC7-1 mutation is a reciprocal translocation involving the left arm of chromosome V and the right arm of chromosome XVI. The chromosome V arm was broken adjacent to the gene CYC7, which determines the primary structure of iso-2-cytochrome c, and this fragment containing the CYC7 gene was joined to the segment of

chromosome XVI. It appears as though the elevation of iso-2-cytochrome c is caused by an abnormal controlling region adjacent to the structural region of the CYC7 gene.

METABOLISM

REFER ALSO TO CITATION(S) 45412, 45417

45374 (BNL—24177) **Regeneration of nutrients by zooplankton and fish off northwest Africa.** Smith, S.L.; Whitledge, T.E. (Dalhousie Univ., Halifax, Nova Scotia (Canada). Inst. of Oceanography; Brookhaven National Lab., Upton, N.Y. (USA)). 1978. Contract EY-76-C-02-0016. 16p. (CONF-780448—1). Dep. NTIS, PC A02/MF A01.

From International council for the exploration of the sea; Las Palmas, Spain (14 Apr 1978).

Data were collected during cruises JOINT I of the Coastal Upwelling Ecosystem Analysis program in 1974 and cruise Gibraltar 75 of the CNEXO program in 1975. The ratios among the release of phosphate, silicate, and ammonia for zooplankton and for nekton were calculated. The ratios for the zooplankton were surprisingly constant across the shelf considering that both biomass and rate were varying in the estimations of regeneration by zooplankton. Data indicated that zooplankton were more significant in the nitrogen dynamics of this upwelling than were fish. It is noted that in an upwelling ecosystem, where diatoms dominate the phytoplankton and the possibility of silicate limitation exists, nekton regenerated no silicate while zooplankton regenerated silicate at a rate that was nearly constant across the shelf. (HLW)

45375 (UR—3490-1379) **Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer.** Mendelsohn, S.L. (Rochester Univ., N.Y. (USA)). 1978. Contract EY-76-C-02-3490. 194p. Dep. NTIS, PC A09/MF A01.

Thesis.

Methods used for the isolation of RNA from rat thymic lymphocytes are described. The involvement of m-RNA in glucocorticoid hormone action in thymic lymphocytes, the hypothesis that initiation of protein synthesis is regulated in part via the balance of adenine nucleotides, and the composition and protein synthetic activity of ribosomes from thymic lymphocytes were examined.

45376 Absence of aryl hydrocarbon hydroxylase (AHH) in three marine bivalves. Vandermeulen, J.H. (Bedford Inst. of Oceanography, Dartmouth, Nova Scotia); Penrose, W.R. *J. Fish. Res. Board Can.;* **35**: No. 5, 643-647(May 1978).

Bivalves exposed to short-term (4 d) and long-term (6 yr) oil pollution were assayed for aryl hydrocarbon hydroxylase (AHH) and N-demethylase activity. Short-term induction studies were carried out on Mya arenaria, Mytilus edulis, and Ostrea edulis incubated in aqueous extracts of Kuwait crude oil or Bunker C (fuel) oil. For the chronic-induction studies Mya arenaria and Mytilus edulis were collected from oiled clam beds (Arrow Bunker C) in Chedabucto Bay, Nova Scotia. None of the bivalves showed any basal or petroleum-hydrocarbon-induced aryl hydrocarbon hydroxylase or N-demethylase activity, as shown by their inability to metabolize benzopyrene or imipramine. In contrast, oil-free control trout and trout taken from a polluted lake readily metabolized both these compounds. The inability of these bivalves to degrade petroleum aromatic hydrocarbons and the tendency of these compounds to accumulate in their tissues present an opportunity for transfer of unaltered hydrocarbons into the food chain.

45377 Bioavailability of crude oil from experimentally oiled sediments to English sole (Parophrys vetulus), and pathological consequences. McCain, B.B.; Hodgins, H.O.; Gronlund, W.D.; Hawkes, J.W.; Brown, D.W.; Myers, M.S. (National Oceanic and Atmosperic Administration, Seattle). *J. Fish. Res. Board Can.;* **35**: No. 5, 663-664(May 1978).

English sole (Parophrys vetulus) were exposed to experimentally oiled (Alaskan North Slope crude oil) sediments over a 4-mo period to assess the bioavailability and tissue hydrocarbon distribution kinetics in flatfish. Data were also obtained on hydrocarbon related physiological changes and tissue pathology. Crude oil was mixed with aromatic hydrocarbon-free sediments to a concentration of 700 μg/g dry weight at the beginning of the experiment. During the 1st mo of the experiment this concentration decreased to 400 μg/g dry weight, and remained relatively stable during the remainder of the 4-mo period. Compositional changes were observed in the alkane and aromatic fractions, with a differential decrease in the substituted naphthalenes. Flatfish maintained in such oiled sediments readily took up alkane and aromatic petroleum hydrocarbons from these sediments, and accumulated these in skin, muscle, and liver; 1- and 2-methylnaphthalene and 1-, 2-, 3-, 4-tetramethylbenzene were accumulated to greater extent than other aromatics. Tissue hydrocarbons decreased with time, and after 27-d continuous exposure to oiled sediments only the liver contained detectable levels of hydrocarbons. After 2 mo <2% of the initial aromatic hydrocarbon load could be detected, and only in the liver in flatfish that were continuously maintained on oiled sediments.

45378 Accumulation and excretion of heavy metals in organisms. Miettinen, J.K. (Univ. of Helsinki). pp 155-162 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Mechanisms detailing the absorption and excretion of heavy metals in animals and man are still only rather vaguely known. In the case of methylmercury, however, a reliable mathematical model exists. Although common features exist among the various metals which permit the drawing of general schemes, the differences among the metals are more marked. In particular, the mechanisms involved in renal excretion are not completely known. The use of radioactive or stable isotopes and new analytical methods make experimental studies easier. Better epidemiological data are necessary in order to be able to evaluate the significance of the parameters of general environmental exposure, which is chronic and at low level.

MEDICINE

REFER ALSO TO CITATION(S) 45272, 45273, 45274

45379 (BNL—24290) **Mobile prompt-gamma in vivo neutron activation facility.** Ellis, K.J.; Vartsky, D.; Cohn, S.H. (Brookhaven National Lab., Upton, N.Y. (USA)). 1978. Contract EY-76-C-02-0016. 17p. (CONF-780538—2). Dep. NTIS, PC A02/MF A01.

From Symposium on nuclear activation techniques in the life sciences; Vienna, Austria (22 May 1978).

This report describes the development and fabrication of a self-contained "neutron-capture" facility in a mobile trailer which is readily transportable. Although the initial project was designed for the measurement of Cd deposited in the liver and kidney of industrial workers, the sensitivity of the system will allow for measurements in normal populations. The limits of detection of Cd are 2.0 mg for kidney and 1.5 μg/g (wet weight) for liver (associated organ radiation dose is 660 mrem). The portable facility makes it possible to study Cd exposed populations in any geographic location. With minor modifications of the collimator, detectors and counting geometry, it is also possible to make in-vivo measurements of total body nitrogen. The neutron source used in the mobile facility is 85 Ci ^{238}Pu,Be shielded by epoxy resin doped with $LiCO_3$ and ^6LiF. Additional shielding is provided by Pb bricks and polyethylene bricks with 1% boron and 80% Pb. For Cd measurements, the detection system consists of two Ge(Li) detectors (25% efficiency each) shielded by bismuth and a 1.5 cm layer of paraffin heavily doped with ^6LiF. For body nitrogen, two shielded 15.2 x 15.2 cm NaI(Tl) detectors are positioned above the scanning bed. This mobile activation facility could be usefully employed in countries which need to monitor industrial populations but which do not have ready access to large neutron research facilities and permanently installed whole-body counters.

45380 (PB—274032) **Review of the use of ionizing radiation for the treatment of benign diseases. Volume I. Committee's report. Final report.** (National Research Council, Washington, D.C. (USA). Assembly of Life Sciences). Sep 1977. Contract FDA-223-75-8222. 65p. NTIS PC A04/MF A01.

Contents: Historical background; Physics and dosimetry of ionizing radiation for treatment of benign diseases; Biological effects and risks; Ionizing radiation therapy in dermatology; Radiation therapy in nuclear medicine; Radiotherapy of benign ocular lesions; Analysis of use of radiation therapy for benign diseases by radiotherapists; Dermatologists' point of view; Radiotherapists' point of view.

45381 (UCRL—80340(Rev.1)) **New developments in ultrasonic imaging of the chest and other body organs.** Campbell, G.W.; Anderson, A.L. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 27 Apr 1978. Contract W-7405-ENG-48. 26p. (CONF-780612—3; IAEA-SM—229/SM). Dep. NTIS, PC A03/MF A01.

From Symposium on advances in radiation protection monitoring; Stockholm, Sweden (26 Jun 1978).

The ultrasonic imaging system described herein was developed to measure chest-wall thickness and the percentage of fat in the chest and around other body organs. The system uses pulse-echo techniques to transmit and detect sound waves reflected from the interfaces of body organs and adjacent tissue. A computer draws these interfaces on color scans, and a code is used to exponentially average data from several points on each scan to find the average

thicknesses of the chest wall and fat layers. These average thicknesses are then used to adjust x-ray calibration factors for plutonium lung counters. The correction factor for three subjects measured for fat content ranging from 12.6 to 22.2% was 18 to 41%. The ultrasonic system also defines the shape and position of the kidneys and liver so we are able to more accurately place detectors on the body during in-vivo radiation measurements. We have also developed a technique for displaying the interfaces from a series of ultrasonic chest scans to produce a topographical map that enables us to better understand the shape and contour of the lung and chest-wall interface.

45382 Reconstruction tomography in diagnostic radiology and nuclear medicine. Ter-Pogossian, M.M.; Phelps, M.E.; Brownell, G.L.; Cox, J.R. Jr.; Davis, D.O.; Evens, R.G. (eds.). Baltimore; University Park Press (1977). 588p. $65.00.

Separate abstracts were prepared for five chapters. An abstract of one chapter appeared previously in ERA.

45383 Some performance and design characteristics of PETT III. Phelps, M.E.; Hoffman, E.J.; Mullani, N.A.; Higgins, C.S.; Ter-Pogossian, M.M. pp 371-392 of Reconstruction tomography in diagnostic radiology and nuclear medicine. Ter-Pogossian, M.M.; Phelps, M.E.; Brownell, G.L.; Cox, J.R. Jr.; Davis, D.O.; Evens, R.G. (eds.). Baltimore; University Park Press (1977).

The theoretical aspects of transaxial reconstruction tomography apply equally well to both transmission and emission tomography. For example, the linear and angular sampling requirements, full angle through which data should be collected, reconstruction algorithms, photon requirement-time-resolution relationships, etc. are basically the same. However, there are a number of practical considerations of these two modalities that present different criteria for the problem of transaxial reconstruction tomography. These are discussed.

45384 Noninvasive brain imaging: computed tomography and radionuclides. DeBlanc, H.J. Jr.; Sorenson, J.A. Acton, MA; Publishing Sciences Group, Inc. (1975). 231p.

Separate abstracts were prepared for two chapters. Ten additional chapters discuss radionuclide imaging of the brain and compare the diagnostic value of brain scanning with a new transmission scanning technique, computerized transaxial tomography (CTT scanning).

TRACER TECHNIQUES

REFER ALSO TO CITATION(S) 45254, 45382, 45383, 45384

45385 (NTIS/PS—78/0031) **Medical information systems (a bibliography with abstracts). Report for February 1964—December 1977.** Harrison, E.A. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 150p.

Medical information systems are related to the prevention, diagnosis, and treatment of human diseases and injuries. Topics covered by the selected abstracts include emergency medical services, medical research, medical laboratories, medical records, radiology, patient monitoring systems and blood banks. Other subject areas included are: benefit cost analysis, evaluation, development, and implementation of medical information systems. (Contains 145 abstracts)

45386 (PB—275632) **Feasibility of investigating the mechanisms of aortic trauma using high-speed cineradiography. A pilot study. Final report, 15 May—31 August 1977.** Culver, R.H.; Bender, M.; Stalnaker, R.L.; Melvin, J.W.; Viano, D.C. (Michigan Univ., Ann Arbor (USA). Highway Safety Research Inst.). 1 Dec 1977. 43p. (UM-HSRI—77-53).

A pilot study was performed to evaluate use of the HSRI high-speed cineradiographic system for study of aortic trauma mechanisms. The thoraxes of anesthetized New Zealand white rabbits were impacted by a dropped accelerometer-instrumented, 1.5 kg mass from a height of 2.44 meters. Velocity and force data were obtained from the instrumented impacting mass. High-speed cineradiographs at approximately 1000 frames per second showed thoracic skeletal deformation and heart, diaphragm, and liver displacements. No radiopaque contrast medium was used in this preliminary investigation. Post-impact autopsy revealed rib fracture, localized hemorrhaging, and aortic transection. On the basis of film obtained, this method has potential for the study of internal organ injury mechanisms.

45387 Reconstruction tomography from incomplete projections. Oppenheim, B.E. pp 155-183 of Reconstruction tomography in diagnostic radiology and nuclear medicine. Ter-Pogossian, M.M.; Phelps, M.E.; Brownell, G.L.; Cox, J.R. Jr.; Davis, D.O.; Evens, R.G. (eds.). Baltimore; University Park Press (1977).

The findings reported are equally applicable to the fields of radiology and nuclear medicine, but the data discussed was aquired with scintillation cameras. Incomplete projections are obtained when the field of view of the detector is limited or when an opaque object lies within the field of view. It is possible to carry out reconstructions from such projections by extimating the missing projection values. A preferable method in most instances, however, appears to be the additive ART iterative method, modified to ignore the missing projection values. When the field of view is limited, one can use knowledge of the true outline of the density or radioactivity distribution to obtain improved reconstructions, by trimming the margin of the reconstruction array at the beginning of, or during, iterative reconstruction. The modified additive ART method, utilizing such trimming, appears to be clearly superior to any other method for reconstruction from projections which cover a limited field of view.

45388 Radionuclide computerized tomography for brain study. Kuhl, D.E.; Edwards, R.Q.; Alavi, A.; Reivich, M.; Rothenberg, H. pp 281-291 of Reconstruction tomography in diagnostic radiology and nuclear medicine. Ter-Pogossian, M.M.; Phelps, M.E.; Brownell, G.L.; Cox, J.R. Jr.; Davis, D.O.; Evens, R.G. (eds.). Baltimore; University Park Press (1977).

Brain scanning with /sup 99m/Tc pertechnetate was complemented by transverse section scanning that enhanced detection and separation of lesions, especially near the base of the brain. With the introduction of x-ray computerized tomography (CT) there is renewed interest in how radionuclide CT can complement these studies and how the method may be exploited to give new kinds of physiologic data. This is a brief review of some of our results and directions in this type of brain study. The radionuclide computerized tomography (CT) scans discussed were obtained on the MARK III scanning system which has four 2-in-diameter x 1/2-in-thick NaI (TI) detectors with focused collimators. It has been used primarily in scanning /sup 99m/Tc or ^{111}In. The index of resolution, full width of half-maximum [FWHM), is approximately 1.3 cm for 140-keV photons. In a typical examination, four conventional rectilinear views of the brain are first obtained by a combination of linear scan motion of the four detectors while indexing the patient stepwise through the scanner between scan lines. These pictures are then generated on a cathode-ray tube (CRT) for interpretation. The physician reviews the scans and selects a scan line on the display for section scanning.

45389 Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography. Derenzo, S.E.; Zaklad, H.; Budinger, T.F. pp 343-358 of Reconstruction tomography in diagnostic radiology and nuclear medicine. Ter-Pogossian, M.M.; Phelps, M.E.; Brownell, G.L.; Cox, J.R. Jr.; Davis, D.O.; Evens, R.G. (eds.). Baltimore; University Park Press (1977).

An analysis is presented of the potentials and limitations of a new scheme for the high-resolution imaging of positron-emitting pharmaceuticals in nuclear medicine. With an activity density of 200 μCi/cm (typically 5 to 20 mCi in the patient) and a 100 keV pulse height threshold the device should operate at 11,000 events per second, including an 11% accidental background and a 26% scattered coincident background. This system has the speed capability for dynamic imaging of brain blood flow (e.g., using ^{11}C, ^{15}O, ^{82}Rb, ^{68}Ga on appropriate compounds) and myocardial uptake of nuclides (e.g., ^{82}Rb or ^{13}N-labeled L-asparagine) as well as high spatial resolution imaging of head, thorax, abdomen, and pelvis.

45390 Circular ring transverse axial positron camera. Cho, Z.H.; Eriksson, L.; Chan, J. pp 393-421 of Reconstruction tomography in diagnostic radiology and nuclear medicine. Ter-Pogossian, M.M.; Phelps, M.E.; Brownell, G.L.; Cox, J.R. Jr.; Davis, D.O.; Evens, R.G. (eds.). Baltimore; University Park Press (1977).

Positron annihilation coincidence detection recorded with multidetector systems has brought futuristic concepts into nuclear medicine. Although there have been a few attempts to use the time-of-flight technique with multidetector arrays a positron camera array has remained the most sophisticated and successful device. The concept of reconstructing source distributions by superimposing multiple cross sections of transverse axial scans in conventional emission imaging is discussed. With the development of transverse axial transmission tomography, it has become apparent that the mathematical reconstruction algorithm derived from it can be applied to emission imaging, in particular to positron annihilation coincidence detection. The basic advantages of positron annihilation coincidence detection in emission imaging are reviewed.

45391 Radiopharmaceuticals. Subramanian, G.; Rhodes, B.A.; Cooper, J.F.; Sodd, V.J. (eds.). New York; Society of Nuclear Medicine, Inc. (1975). 570p.

Fifty-six papers presented at the International Symposium on Radiopharmaceuticals held in Atlanta, Georgia, February 12-15, 1974 are included. Recent advances in the preparation and diagnostic uses of labelled compounds are reported. Abstracts of 13 of the papers have appeared in ERA.

45392 Computerized emission transaxial tomography and determination of local brain function. Kuhl, D.E.; Alavi, A.; Reivich, M.; Edwards, R.Q.; Fenton, C.A.; Zimmerman, R.A. pp 67-79 of Noninvasive brain imaging: computed tomography and radionuclides. DeBlanc, H.J. Jr.; Sorenson, J.A. Acton, MA; Publishing Sciences Group, Inc. (1975).

Accurate knowledge of regional function in the brain would be of great value for the detection and localization of a wide variety of diseases and for assessment of patients under treatment. The management of patients would be greatly improved with a day-to-day knowledge of the status of blood flow, blood volume, metabolism, permeability, brain swelling, and other functions on a local basis throughout the brain. In the past this kind of information has not been available. Instead, function has usually been examined only for the organ as a whole and regional information has been restricted to morphology as determined by radiographic or radionuclide imaging studies. Three-dimensional radionuclide reconstruction imaging will become more important in the study of the brain, providing accurate measurement of radionuclide concentration within functional structural units of the brain. Measurement of local function with three-dimensional resolution throughout the brain and without the necessity for intracarotid injection of indicator could therefore provide a significant advance over presently available methods.

45393 Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer-assisted CNS studies. Budinger, T.F.; DeLand, F.H.; Duggan, H.E.; Bouz, J.J.; Hoop, B. Jr.; McLaughlin, W.T.; Weber, P.M. pp 45-66 of Noninvasive brain imaging: computed tomography and radionuclides. DeBlanc, H.J. Jr.; Sorenson, J.A. Acton, MA; Publishing Sciences Group, Inc. (1975).

Two-dimensional computer image-processing techniques have not proved to be of importance in diagnostic nuclear medicine primarily because the radionuclide distribution represents a three-dimensional problem. More recent developments in three-dimensional reconstruction from multiple views or multiple detectors promise to overcome the major limitations in previous work with digital computers. These techniques are now in clinical use for static imaging; however, speed limitations have prevented application to dynamic imaging. The future development of these methods will require innovations in patient positioning and multiple-view devices for either single-gamma or positron annihilation detection.

MICROBIOLOGY

REFER ALSO TO CITATION(S) 45373

PATHOLOGY

REFER ALSO TO CITATION(S) 45341, 45422

45394 Ageing changes in the liver of two poeciliid fishes, the guppy Poecilia (Lebistes) reticulata and the Amazon molly, P. formosa. Woodhead, A.D. (Brookhaven National Lab., Upton, NY). *Exp. Gerontol.;* **13**: 37-45(1978).

Changes in the anatomy of the liver throughout life are described for two fishes, the guppy and the Amazon molly. There were few consistent and marked changes with age, other than an increase in lipochrome pigment in the guppy. Only in the livers of the two oldest females, which were senile and post-reproductive were there signs of alterations in liver cytology, which might have caused impairment of liver function.

PHYSIOLOGICAL SYSTEMS

REFER ALSO TO CITATION(S) 45384, 45392, 45393

PUBLIC HEALTH

REFER ALSO TO CITATION(S) 45422

AGRICULTURE AND FOOD TECHNOLOGY

REFER ALSO TO CITATION(S) 44865, 45329

BIOMEDICAL SCIENCES, APPLIED STUDIES

EXTERNAL SOURCE

REFER ALSO TO CITATION(S) 45395, 45399, 45401

RADIATION EFFECTS ON ANIMALS

MAN

REFER ALSO TO CITATION(S) 44254, 45427

45395 (LA—7196-MS) **RBEOER: a FORTRAN program for the computation of RBEs, OERs, survival ratios, and the effects of fractionation using the theory of dual radiation action.** Zaider, M.; Dicello, J.F. (Los Alamos Scientific Lab., N.Mex. (USA)). May 1978. Contract W-7405-ENG-36. 21p. Dep. NTIS, PC A02/MF A01.

Portions of document are illegible.

The computer code RBEOER calculates RBEs, OERs and survival curves as a function of the dose delivered to a biological system and the temporal distribution of the dose (fractionation). The method of calculation is based on the theory of dual radiation action. The basic formalism and the input parameters are described. A sample output is presented.

45396 (LA-UR—78-1205) **Investigation of the microdosimetric characteristics of broad, therapeutic beams of negative pions at LAMPF.** Dicello, J.F.; Zaider, M. (Los Alamos Scientific Lab., N.Mex. (USA)). 1978. Contract W-7405-ENG-36. 13p. (CONF-780534—1). Dep. NTIS, PC A02/MF A01.

From 6. symposium on microdosimetry; Brussels, Belgium (May 1978).

Preclinical human studies with negative pions are presently being conducted at the Clinton P. Anderson Meson Physics Facility (LAMPF) of the Los Alamos Scientific Laboratory. Presently, the proton current at LAMPF is 300 μA, average, and the instantaneous pion rate at the biomedical channel is about 2.4×10^7 pions/sec, cm^2. This corresponds to a dose rate of about 6 rad/min in a 1 liter volume. Conventional microdosimetric techniques are not applicable at these event-rates because of detector damage, gas breakdown, pileup and deadtime effects, and saturation of the electronics. A new microdosimetric system developed at LAMPF in order to overcome these problems is described. Treatment fields as large as 17 x 17 cm^2 and as deep as 10 cm have been developed. The radiation quality of such pion beams is changing rapidly throughout the treatment volume. For this reason, microdosimetric data have been obtained for a broad, therapeutic beam (10 cm deep, 1 liter volume) as part of a continuing program to characterize those aspects of the radiation quality which produce changes in the biological response. Microdosimetric data have been obtained at several positions along the central axis of the beam in the peak region. The characteristics of the broad, pion beams are discussed and are compared with those of a narrow pion beam, with neutron data, and with data for broad, heavy-ion beams. An attempt is made to calculate broad beam distributions from data for narrow beams for purposes of treatment planning, and the results are compared with the measured spectra.

45397 (NTIS/PS—78/0036) **Biological effects of laser radiation (a bibliography with abstracts). Report for 1964—January 1978.** Crockett, P.W. (National Technical Information Service, Springfield, Va. (USA)). Jan 1978. 247p.

The bibliography cites reports on radiation injuries, permissible dosage, protective devices, and safety measures. Included are references on the pathology of eye lesions caused by lasers. (This updated bibliography contains 242 abstracts, 31 of which are new entries to the previous edition.)

45398 (STI/PUB—441(Vol.1)) **Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy.** (International Atomic Energy Agency, Vienna (Austria)). Oct 1977. 459p. (CONF-761193—P1). IAEA $34.00.

From Symposium on the radiobiological research needed for the improvement of radiotherapy; Vienna, Austria (22 Nov 1976).

Thirteen papers were presented on dose fractionation in radiotherapy. Some topics considered were tumor growth delay; tumor control probability and regression rate; radiotherapeutic management of nasopharyngeal carcinoma; radiation tolerance of the spinal cord; and new techniques in electron therapy. Eight papers on radiomodifiers were concerned with radiosensitizing effects of oxygen, hypoxia, hyperthermia, drugs, and hormones on tumor cells. Eight papers were presented on hyperthermia. Some topics consid-

ered were comparative effects of negative pions, gamma radiation, and hyperthermia on a tumor model; effects of hyperthermia on radioinduced DNA damage; and clinical aspects of hyperthermia as an adjuvant to x-ray therapy. Six papers were presented on combined radio and chemotherapy. (HLW)

45399 (STI/PUB—441(Vol.2)) **Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy.** (International Atomic Energy Agency, Vienna (Austria)). Dec 1977. 296p. (In English and French). (CONF-761193—P2). IAEA $23.00.

From Symposium on the radiobiological research needed for the improvement of radiotherapy; Vienna, Austria (22 Nov 1976).

Eight papers were presented on effects of high LET radiation. Some topics considered were as follows: effects of accelerated heavy nuclei of neon and argon on mammalian cells; neutron therapy; genetic and RBE studies on negative pi-meson beam; impulse cytophotometry; intracavitary treatment with ^{252}Cf; and local variation of RBE and OER for neutron therapy. Four papers on cellular models included studies on radiation effects and hyperthermia; damage in yeast cells after irradiation with fast electrons, x-rays, and ^{241}Am; effects of ATP on radiosensitivity of yeast; and experiments at CYCLONE with d(50)-Be neutrons. Nine papers were presented on radiobiological effects in vivo. Some topics included were radioinduced liver damage; effects of hypoxia on radiotherapy; excretion of pyrimidine deoxyribonucleosides after radio- and chemotherapy; the immuno-depressive effect of radio- and chemotherapy; and late effects after radiotherapy. (HLW)

45400 **Radiological protection. First European symposium on rad-equivalence.** Chanet, R. (et al.). Luxembourg; Commission of the European Communities (1977) 243p. (EUR—5725e; CONF-760578—). European Community Information Service, Washington, DC.

From Seminar on radiation biology and protection; Orsay, France (24 May 1976).

Twenty-four papers discuss the following aspects of radiological protection: dose-effect relationships with emphasis on small doses; notions of risk and related quantitative data; and radiation equivalent dose of chemical mutagens. (HLW)

VERTEBRATES

REFER ALSO TO CITATION(S) 45395, 45399

45401 (LA-tr—77-73B) **Preclinical experiments for analysis of tumor regression due to negative pions.** Blattmann, H.; Cabeza, L.; Fritz-Niggli, H. (Zurich Univ. (Switzerland)). 1977. Translation of PK-AN—71-2(Add.1). 10p. Dep. NTIS, PC A02/MF A01.

To test the potential therapeutic value of negative pions in comparison with conventional x-rays, cobalt-60 γ rays, and high energy electrons and photons (Betatron), experimental analyses with induced tumors (transplant tumors) after irradiation are to be performed in vivo and in vitro (tumor cell suspensions, cell cultures, spontaneous tumors, carcinoma in ascites form); in addition to tumors primarily of mice, human cell tumors will be used; studies will also be made of cell kinetics with various cell types (normal cells, transformed (malignant) cells, beam-resistant, beam-sensitive types) using cell cultures from Chinese hamsters. An attempt will be made to compare slow- and fast-growing tumors. In a second phase, human tumors in conditioned animals will be tested in situ or as cell cultures. Skin, small intestine, regenerating liver and kidney, together with cell cultures, will serve as normal reaction systems.

RADIONUCLIDE EFFECTS - INTERNAL SOURCE

MAN

REFER ALSO TO CITATION(S) 45318

45402 (ORNL/NUREG/TM—84) **INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide.** Killough, G.G.; Dunning, D.E. Jr.; Pleasant, J.C. (Oak Ridge National Lab., Tenn. (USA)). 2 Feb 1978. Contract W-7405-ENG-26. 101p. Dep. NTIS, PC A06/MF A01.

This report describes a computer code, INREM II, which calculates the internal radiation dose equivalent to organs of man which results from the intake of a radionuclide by inhalation or ingestion. Deposition and removal of radioactivity from the respiratory tract is represented by the ICRP Task Group Lung Model. A four-segment catenary model of the GI tract is used to estimate movement of radioactive material that is ingested or swallowed after being cleared from the respiratory tract. Retention of radioactivity in other organs is specified by linear combinations of decaying exponential functions. The formation and decay of radioactive daughters is treated explicitly, with each radionuclide species in the chain having its own uptake and retention parameters, as supplied by the user. The dose equivalent to a target organ is computed as the sum of contributions from each source organ in which radioactivity is assumed to be situated. This calculation utilizes a matrix of S-factors (rem/μCi-day) supplied by the user for the particular choice of source and target organs. Output permits the evaluation of cross-fire components of dose when penetrating radiations are present. INREM II is coded in FORTRAN IV and has been compiled and executed on an IBM-360 computer.

45403 (ORNL-tr—4619) **Status of plutonium assessment in lung.** Shirotani, T.; Akaiski, J.; Fujita, M. Translated by H. Kubota from *Nippon Genshiryoku Gakkaishi;* **18**: No. 9, 572-581(1976). 22p. Dep. NTIS, PC A03/MF A01.

The technology for measuring Pu deposited in the lung through inhalation has assumed considerable importance as the result of the increased number of facilities that handle Pu and the increase in the quantities being handled together with the proposal to lower the maximum permissible uptake by the lung. This paper discusses the status of technological development and problem areas related to a direct measurement method (external measurement method) for assaying the lung dose. In addition, analysis of the data and associated problems are considered in terms of dose evaluation and damage evaluation.

ANIMALS

45404 (ORNL-tr—4544) **Lung tumors in rats on chronic inhalation of thorium dioxide.** Likhachev, Yu.P.; Lyarskii, P.P.; Elovskaya, L.T. Translated from *Vopr. Onkol.;* **19**: No. 11, 47-54(1973). 14p. Dep. NTIS, PC A02/MF A01.

The blastomogenic properties of low-solubility radioactive aerosols (inhalation of thorium dioxide) are in dependence on dose rate, total dose absorbed, and the microdistribution of radioactive particles. In chronic inhalation of thorium dioxide aerosol, tumors arise in 100% of the animals on absorption of a dose of 2700 rads by the lungs, 15 months from the start of the experiment in the peripheral sections of the lungs, where the largest amount of the aerosol is concentrated. In induced lung cancers, multicentricity of the development of adenomatosis, bronchiolar adenomas, highly-differentiated adenocarcinomas, and flat-cell keratinized cancers on a background of metaplasia of the epithelium close to and in the zone of lung fibrosis and dust accumulation is characteristic. Pre-blastomatosis metaplastic processes in the bronchiolar and alveolar epithelia arise in zones of localization of radioactive aerosols; later in the growth of the tumor, dust particles (coniophages) are displaced to the periphery, which causes visibility of the generation of tumors in a zone of lesser absorbed dose.

NUCLIDE KINETICS AND TOXICOLOGY

MAN

REFER ALSO TO CITATION(S) 45402

ANIMALS

45405 **Gastrointestinal absorption and distribution of ^{144}Ce in the suckling pig.** Mraz, F.R.; Eisele, G.R. (Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)). *Health Phys.;* **33**: No. 5, 494-495(Nov 1977).

Although poorly absorbed through the GI tracts of adults ^{144}Ce has been reported to be absorbed in substantial quantities in suckling mice and rats. In order to confirm these findings in a large monogastric animal ^{144}Ce was administered orally to piglets from two litters of less than one day and 4 days of age. They were sacrificed from 3 to 21 days later and the different organs and tissues were assayed for ^{144}Ce content. Tabulated results show the percentage of the ^{144}Ce dose found in the bodies and its distribution in the tissues. About 3 times more ^{144}Ce was found in piglets dosed prior to 24 hr of age than in those dosed at 4 days of age. This may be explained by observations made by Lecce (J. Nutr. 103, 751, 1973). It is concluded that the relatively high absorption of ^{144}Ce by the piglet and its accumulation in the skeleton where it has a long biological half-life makes it necessary to reconsider the hazards of acute doses of ^{144}Ce in the juvenile.

THERMAL EFFECTS

45406 (ORNL/EIS—124) **Thermal effects on aquatic organisms: an annotated bibliography of the 1976 literature.** Talmage, S.S.

(comp.). (Oak Ridge National Lab., Tenn. (USA)). May 1978. Contract W-7405-ENG-26. 251p. Dep. NTIS, PC A12/MF A01.

This bibliography, containing 784 annotated references on the effects of temperature on aquatic organisms, is part of an assessment of the literature on the effects of thermal power plants on the environment. The effects of thermal discharges at power plant sites are emphasized. Laboratory and field studies on temperature tolerance and the effects of temperature changes on reproduction, development, growth, distribution, physiology, and sensitivity to other stresses are included. Indexes are provided for author, keywords, subject category, geographic location of the study, taxon, and title (alphabetical listing of keywords-in-context of nontrivial words in the title).

CELLS

45407 (UCRL-Trans—11366) **Periods of surface waves.** Sabitova, T.M. Translated from *Izv. Akad. Nauk Kirg. SSR, Ser. Estestv. Tekh. Nauk;* **5**: No. 6, 41-52(1963). 19p. Dep. NTIS, PC A02/MF A01.

One of the criteria for the identification of explosions is based on the fact that the predominant period of surface waves is smaller for explosions than for earthquakes of the same energy, all other conditions being equal. The possibility of the practical application of this criterion for identification of explosions is determined by the possibility of finding a stable predominant period for a sufficiently broad class of earthquakes. The present article is devoted to an analysis of the periods of surface waves from earthquakes recorded by the Frunze and some other stations. Seismograms of the Frunze seismic station containing records of earthquakes that occurred in the China-Pakistan-Burma region (epicentral distances from 400 to 3500 km, magnitudes from 1 to 7) and that were registered by Kirnos system seismographs in the period 1955-1959 were analyzed. This region was selected because a large number of earthquakes with various epicentral distances occur within it.

CHEMICALS METABOLISM AND TOXICITY

REFER ALSO TO CITATION(S) 44593, 45106

MICROORGANISMS

REFER ALSO TO CITATION(S) 44176, 44182, 44184, 44776

45408 Distribution and abundance of hydrocarbon-utilizing bacteria in sediments of Chedabucto Bay, Nova Scotia, in 1976. Stewart, J.E. (Fisheries and Environmental Sciences, Halifax, Nova Scotia); Marks, L.J. *J. Fish. Res. Board Can.;* **35**: No. 5, 581-584(May 1978).

An extensive reexamination of Chedabucto Bay, Nova Scotia, sediments was carried out in the summer of 1976 for comparison with data obtained shortly after the major oil spill in 1970. Only 2 of the 79 sediment samples examined microbiologically had large numbers of hydrocarbon-utilizing bacteria. The bulk of sediments were, with regard to bacterial populations, comparable to areas described as "clean," i.e., no apparent or known contamination with oil.

45409 Microbial ecology studies of the Metula spill in the Straits of Magellan. Colwell, R.R. (Univ. of Maryland, College Park); Mills, A.L.; Walker, J.D.; Garcia-Tello, P.; Campos-P., V. *J. Fish. Res. Board Can.;* **35**: No. 5, 573-580(May 1978).

The grounding of the tanker V.L.C.C. Metula in the Straits of Magellan in August 1974 provided a unique opportunity to study a massive spill in a cold region on a long-term basis. Removal of spilled oil from the Metula was solely by in situ physiochemical and biological mechanisms. Microbiological studies undertaken in May 1976 showed increased heterotrophic bacterial populations at oil-impacted sites. A cold-tolerant population of petroleum degrading bacteria was observed. From biodegradation studies, we concluded that oil degradation under in situ conditions proceeds relatively slowly, with marked persistence of Metula oil in the Straits of Magellan 2 yr after the original spill.

PLANTS

REFER ALSO TO CITATION(S) 44180, 44182, 44183, 44184, 45337, 45357

45410 Comparison of oiled and unoiled intertidal communities in Chedabucto Bay, Nova Scotia. Thomas, M.L.H. (Univ. of New Brunswick, Saint John, Can.). *J. Fish. Res. Board Can.;* **35**: No. 5, 707-716(May 1978).

During 1976, detailed surveys of four oiled and four unoiled control stations, each subdivided into seven standardized intertidal levels, were carried out in Chedabucto Bay. Seventy-one species were found, 14 unique to control and 9 to oiled locations. Species diversity was uniformly higher at control than oiled stations. No differences in horizontal zonation of major species were apparent. Analysis of abundance and biomass data for the eight stations and seven tidal levels showed a significant overall difference between oiled and control situations. However, no particular station or tidal level was significantly different from any other. Ten species accounted for most of the variance between oiled and control stations. Six of these were more important at controls and four more important at oiled stations. The flora were particularly affected at oiled stations and species dominant on both sedimentary and rocky shores at all but the lowest tidal levels have been reduced. Length and weight data for the clam Mya arenaria showed significantly lower values at oiled stations, but that for the periwinkle Littorina littorea showed the opposite. The length-weight relationship for both of these species showed a significantly lower increase in weight per unit of length at oiled than at control stations. Oiled stations showed significantly greater concentrations of oil in biota and sediments than unoiled, where concentrations were essentially at background levels.

45411 Observations of a cold-water intertidal community after 5 years of a low-level, persistent oil spill from the General M.C. Meigs. Clark, R.C. Jr.; Patten, B.G. (National Marine Fisheries Service, Seattle). *J. Fish. Res. Board Can.;* **35**: No. 5, 754-765(May 1978).

A rich and productive intertidal community was exposed continually for over 5 yr to small quantities of a Navy Special fuel oil from the unmanned troopship General M. C. Meigs that came aground on the Washington coast in January 1972. Observations of animal and plant populations and their petroleum hydrocarbon uptake patterns showed early evidence of contamination and the persistence of the oil spill throughout the study period. Abnormal and dead urchins, and loss of algal fronds and pigment were observed in localized areas near the wreck for at least 1 yr. Within 2 mo of the accident, paraffinic hydrocarbons had been taken up by prominent members of the community and continued to appear in certain species even after 5 yr. Although changes were seen in certain species during the early days of this persistent low-level pollution incident, the community balance in this rocky, intertidal ecosystem does not appear to have been markedly altered.

INVERTEBRATES

REFER ALSO TO CITATION(S) 44176, 44180, 44181, 44182, 44183, 44184, 44776, 45333, 45339, 45410, 45411

45412 Effects of uptake and discharge of petroleum hydrocarbons on the respiration of the soft-shell clam, Mya arenaria. Stainken, D.M. (Environmental Protection Agency, Edison, NJ). *J. Fish. Res. Board Can.;* **35**: No. 5, 637-642(May 1978).

A winter (4°C) spill condition was simulated in which young soft-shell clams, Mya arenaria, were exposed to subacute concentrations of No. 2 fuel oil-in-water emulsions for 28 d. Clams were exposed at the beginning of the experiment to single dose concentrations of 10, 50, and 100 ppM. Hydrocarbons were rapidly accumulated by clams within 1 wk after exposure. The accumulated hydrocarbons then decreased each week as the hydrocarbon content of the water decreased. Methyl substituted naphthalene isomers were the principal compounds accumulated and retained by the clams after 3 wk of oil exposure. A dose-response relationship was observed in the respiratory rates as measured by oxygen consumption (QO_2). Significant differences ($P = .05$) in respiratory rates were found in clams exposed to low concentrations of oil. The lowest concentrations of oil caused a doubling of the respiratory rates and greater oil concentrations caused a depression in rate. The respiratory rates of the clams exposed to low oil concentrations decreased as the hydrocarbon content of the water and clam tissues decreased, but remained significantly altered from the controls. Clams were transferred to an uncontaminated system for 14 d subsequent to the 28-d oil exposure to determine effects of depuration on the respiratory rate. During the depuration period, many of the hydrocarbons present in clam tissue were again found to be methyl substituted napththalene isomers. During this period, the respiratory rates of the clams initially exposed to 10 ppM fuel oil emulsion remained significantly altered above the controls. The respiratory rates of all groups of oil-exposed clams remained altered from the controls, but the magnitude of difference tended to decline toward the controls. A dose-response narcosis may have been evident during this period.

45413 Importance of sediment working by the deposit-feeding polychaete Arenicola marina on the weathering rate of sediment-bound oil. Gordon, D.C. Jr.; Dale, J.; Keizer, P.D. (Bedford Inst. of Oceanography, Dartmouth, Nova Scotia). *J. Fish. Res. Board Can.;* **35**: No. 5, 591-603(May 1978).

The interactions between the polychaete Arenicola marina, a common deposit feeder in sandy intertidal areas, and sediment contaminated with the fresh API (American Petroleum Institute) reference oils and weathered Bunker C oil remaining from the 1970 Arrow spill were investigated in laboratory experiments. Worms can

tolerate low concentrations of sediment-bound oil, although the sediment working rate is reduced depending upon oil type, concentration, and degree of weathering. Hydrocarbon concentrations, measured gravimetrically and by gas chromatography and fluorescence spectroscopy, were substantially lower (17-72%) in worm casts than in initial sediment. This loss can be accounted for by microbial degradation, which is stimulated by the worms' activity, uptake of hydrocarbons into worms, and perhaps dissolution. A large population (10-25/m^2) of Arenicola is present at Black Duck Cove, N.S., living in sediment contaminated with weathered Bunker C oil remaining from the Arrow spill. These worms, which have spent their entire lives in oil-polluted sediment, do not have markedly elevated hydrocarbon concentrations and behaved no differently in experiments than worms collected from a clean environment. Calculations suggest that they are capable of removing the oil present in a square metre of sediment in 2-4 yr. After any oil spill, when concentrations reach tolerable levels, activities of deposit-feeding animals such as Arenicola can apparently accelerate the weathering rate of sediment-bound oil.

45414 Long-term effects of an oil spill on population of the salt-marsh crab Uca pugnax. Krebs, C.T. (St. Mary's Coll. of Maryland, St. Mary's City); Burns, K.A. *J. Fish. Res. Board Can.;* **35**: No. 5, 648-649(May 1978).

A spill of fuel oil at West Falmouth, Massachusetts, in 1969 contaminated contiguous salt marshes with up to 6000 μg oil/g (ppM) of wet mud and affected local populations of the salt-marsh crab Uca pugnax. Directly related to high sediment oil content were reduced crab density, reduced ratio of females to males, reduced juvenile settlement, heavy overwinter mortality, incorporation of oil into body tissues, behavioral disorders such as locomotor impairment, and abnormal burrow construction. Concentrations of weathered fuel oil >1000 ppM were directly toxic to adults, while those of 100-200 ppM were toxic to juveniles. Cumulative effects occurred at lower concentrations. Recovery of the marsh from this relatively small oil spill is still incomplete after 7 yr. Interpretation of the crab population data upon the basis of detailed analysis of the aromatic fraction of the fuel oil provided by Dr. J. Teal, Woods Hole Oceanographic Institution, showed that recovery of the crab populations was highly correlated with the disappearance of the naphthalene fraction of the aromatics.

45415 Effects of chronic exposure to petroleum upon the growth and molting of juveniles of the arctic marine isopod crustacean Mesidotea entomon. Percy, J.A. (Fisheries and Marine Service, Quebec). *J. Fish. Res. Board Can.;* **35**: No. 5, 650-656(May 1978).

Juveniles of the benthic marine isopod Mesidotea entomon were chronically exposed to different concentrations of water-soluble fractions of fresh and weathered Norman Wells crude oil and of fresh Pembina crude for 160 d. The 100% extracts contained 1.72, 1.12, and 0.56 ppM of oil (determined fluorimetrically), respectively. Most of the animals completed five or six molts before the end of the experiment. Long-term mortality was high in the 100% extracts of the oils (LT50 = 17, 17, and 41 d, for Norman Wells, Pembina, and weathered Norman Wells, respectively) but most of the animals molted at least once before dying. None of the deaths occurred in conjunction with the molt. Stimulation of the onset of the subsequent molt occurred in some exposure groups. A significant increase in the duration of the intermolt period only occurred at the highest oil concentrations. Effects on growth were slight at concentrations lower than that which is lethal during chronic exposure. Exposure to fresh Norman Wells crude depressed growth slightly, while Pembina crude slightly stimulated growth. Weathered Norman Wells severely inhibited growth at the highest concentration but stimulated growth slightly at lower concentrations.

45416 Pathological changes in a marine fish after a 6-month exposure to petroleum. Payne, J.F. (Fisheries and Marine Service, St. John's, Newfoundland, Can.); Kiceniuk, J.W.; Squires, W.R.; Fletcher, G.L. *J. Fish. Res. Board Can.;* **35**: No. 5, 665-667(May 1978).

Cunners (Tautogolabrus adspersus) were chronically exposed to Venezuelan crude in a flow-through seawater system. The survival rate was >95%. The following parameters were examined: appearance of fish and internal organs from a series of color photographs; fish condition index; hematocrit; somatic indices of liver, heart, spleen, and gonads; eye lens diameter; and plasma chloride. Liver, kidney, heart, spleen, gonad, gill, muscle, and gut tissues were also examined from paraffin sections for pathological changes. There were significant differences in testis somatic index, lens diameter, and plasma chloride between the two fish groups. No histopathological changes were observed.

45417 Physiological stresses and response in chronically oiled organisms. Anderson, J.W. (Marine Research Lab., Sequim, WA); Malins, D.C. *J. Fish. Res. Board Can.;* **35**: No. 5, 679-680(May 1978).

Subject matter in Session II of the Proceedings of the Symposium on "Recovery Potential of Oiled Marine Northern Environments" included: effects of oiled sediments on field populations, bioavailability of sediment-bound hydrocarbons, tissue retention of hydrocarbons, and means of determining effects on biota. Hopefully, future work in these areas will include the chemical analysis of products of enzymatic degradation in tissues and the biological effects of petroleum weathered through chemical and microbial oxidations. Studies of chemical alterations of sediments should be coupled with organismic, population, or community effects. Data generated should give information on rates of habitat recovery and levels of contamination that allow "normal" community survival.

45418 Recovery of benthic macrofauna from chronic pollution in the sea area off a refinery plant, southwest Finland. Leppaekoski, E.J. (Inst. of Biology, Abo, Finland); Lindstroem, L.S. *J. Fish. Res. Board Can.;* **35**: No. 5, 766-775(May 1978).

Quantitative field studies (density, wet weight biomass, Shannon diversity, species richness, evenness of distribution) on benthic sublittoral macrofauna were made in the vicinity of an oil refinery in southwest Finland before and after the installation of a new wastewater treatment plant that reduced the amount of oil and liquid effluents by ca. 90-95%. The number of species and species diversity increased during the 1st and 2nd yr after pollution abatement at the stations close to the former outflows. The amphipods pontoporeia affinis, Corophium volutator, and C. lacustre, midge larvae of the Chironomus plumosus-group, the oligochaete Tubifex costatus, the polychaetes Harmothoe sarsi and Polydora redeki, and the bivalve Cardium sp. were the most successful recolonizers of the 23 taxa sampled. The strong lethal effect of oil-contaminated sediments upon Chironomus plumosus larvae decreased markedly in laboratory experiments (LT50 was estimated at 7 d in 1973 and at 28 d in 1974; in 1975, 80-90% of the larvae survived for 28 d). Details of postabatement succession are discussed. The results demonstrate not only the recovery from chronic oil pollution but also the degree of ecological damage caused by previous continuous discharge of oil.

VERTEBRATES

REFER ALSO TO CITATION(S) 44182, 44594, 44597, 44776, 45337, 45339, 45357, 45417

45419 Influence of environmental contamination on cytochrome P-450 mixed-function oxygenases in fish: implications for recovery in the Wild Harbor Marsh. Stegeman, J.J. (Woods Hole Oceanographic Inst., MA). *J. Fish. Res. Board Can.;* **35**: No. 5, 668-674(May 1978).

Levels of hepatic cytochrome P-450 and the catalytic functions benzo[a]pyrene hydroxylase and aminopyrine demethylase were significantly greater in populations of mummichog, Fundulus heteroclitus, sampled from contaminated marshes than in those fish from nearby reference marshes. Aminopyrene demethylase, but not benzo[a]pyrene hydroxylase, was also elevated in fish from one of the reference marshes. The levels of cytochrome P-450 and benzo[a]pyrene hydroxylase were highest in fish from the Wild Harbor Marsh, site of the 1969 Florida spill. A correlation between size and benzo[a]pyrene hydroxylase activity was identified in some of the populations studied, although influence by this factor did not mask the population differences. The results are consistent with the hypothesis that elevated levels of mixed-function oxygenase activity in fish from Wild Harbor are the result of oil spilled 8 yr ago, and that recovery of this marsh is not yet complete.

45420 (ORNL-tr—4594) **Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat.** Mogilnicka, E.M.; Piotrowski, J.K.; Tomaszewski, A. Translated by S.D. Blalock Jr. from *Bromatol. Chem. Toksykol.;* **9**: No. 3, 357-359(1976). 4p. Dep. NTIS, PC A02/MF A01.

The following metals were investigated from the point of view of their stimulating effect on the level of organ metallothionein: Rb, Cs, He, Tl, Sb and U. At the same time rats were exposed to cadmium to act as a control over the results obtained. The results of the research referring to the metallothionein level in the liver and kidneys of rats exposed to the metals and of the control rats are tabulated. The metallothionein levels in the control rat organs did not deviate from the results obtained in earlier works, and amounted on the average to 0.54 mg/g of tissue in the kidney and 0.19 mg/g of the tissue in the liver. The administration of cadmium caused a significantly high increase in the level of metallothionein in the liver and kidney to a degree comparable to that obtained earlier in other works (4, 7). Other metals not investigated earlier from this point of view (Rb, Cs, Tl, Sb and U) did not exhibit this significant rise in the level of metallothionein in any organs (the significance of the differences were determined at $\alpha = 0.05$). Exposure to silver nitrate caused an approximate double increase in the level of metallothionein in the liver, with no effect on the level of this protein in the kidneys. The two-fold increase in the level of metallothionein in the liver after exposure to silver nitrate can testify to the stimulating properties of this metal. In addition, it cannot be excluded that the results obtained by the radiochemical method could be underestimated in regard to the presence of silver-thionein in the tissue, because

of the very close electrochemical potential of silver and mercury used as an indicator (Ag 0.80 mV, Hg 0.85 mV). Using silver-thionein obtained in vitro, which was added as a comparative internal model, demonstrated that the indicator yield with radioactive ^{203}Hg is about 4 times lower than when a metallothionein model is used without being saturated with silver.

MAN

REFER ALSO TO CITATION(S) 44089, 45340, 45357

45421 (NP—23191, pp 1-41) **Carcinogens in the environment.** Dec 1975.

In Environmental quality. The sixth annual report of the Council on Environmental Quality.

The following topics are considered: life expectancy, environmental causes of disease, cancer incidence, causes of cancer, identification of carcinogens, human population studies, cancer prevention, and survival rates. (HLW)

45422 (PB—274339) **Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis.** Hammer, D.I. (Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.). Sep 1977. 148p. (EPA/600/1—77/043). NTIS PC A07/MF A01.

Acute lower respiratory disease was surveyed by questionnaire among parents of 10,000 children aged 1 to 12 years in two Southeastern communities representing intermediate and high exposures to particulates and low sulfur dioxide levels. Morbidity reporting patterns with respect to age, parental education, and history of asthma were similar for blacks and whites, but the frequency of pneumonia was significantly lower, and the frequencies of croup, bronchitis, and 'any lower respiratory disease' were significantly higher among whites in both communities. Significant increases of any lower respiratory diseases and hospitalization were found among children in the high exposure community. Asthma rates clustered in families, were higher in male children and female parents, and were comparable to other studies. Significant increases of lower respiratory disease were also found among asthmatic children in the high exposure community. Difference in parental recall, family size, or parental cigarette smoking were not likely explanations for the excess morbidity in the high exposure community. Therefore, these results associate excess acute lower respiratory disease in children with exposure to elevated particulate levels and low sulfur dioxide concentrations.

45423 **Review of dose-response relationships resulting from human exposure to methylmercury compounds.** Clarkson, T.W.; Smith, J.C.; Marsh, D.O.; Turner, M.D. (Univ. of Rochester, NY). pp 1-12 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

Published studies of dose-response relationships in several populations exposed to methylmercury fall into three general categories, distinguished according to intensity and duration of exposure. One group consists of populations in Minamata and Niigata, Japan, where people were exposed to high concentrations of methylmercury in fish and many cases of poisoning occurred. The second group comprises persons who have a high daily intake of fish in areas of the world where methylmercury concentrations in the fish are high but no cases of poisoning have been reported. The third population is in Iraq, where people received methylmercury in contaminated bread, resulting in the exposure of many thousands of persons, a large number of cases of poisoning, and many fatalities. These three populations differ with respect to the intensity and duration of exposure to methylmercury. A comparison of the effects of methylmercury in these three populations should lead to a better understanding of the effects of methylmercury in man.

45424 **Toxicity of cadmium: mechanism and diagnosis.** Nomiyama, K. (Jichi Medical School, Tochigi-Ken, Japan). pp 15-23 of Heavy metals in the aquatic environment. Krenkel, P.A. (ed.). Elmsford, NY; Pergamon Press Inc. (1975).

From Conference on heavy metals in the aquatic environment; Nashville, TN, USA (Dec 1973).

See CONF-731241—.

The following topics are discussed: signs of cadmium poisoning in cadmium workers--emphysema, dysfunction of the kidneys, and low molecular weight proteinuria; mechanism of Cd accumulation in the kidneys; mechanism of urinary excretion of Cd; mechanism of Cd nephropathy: identification of low molecular weight proteins in urine of Cd workers and itai-itai disease patients; simple determination of low molecular weight proteins; early symptoms of Cd intoxication; diagnostic techniques of Cd poisoning; and Cd as an etiological agent of itai-itai disease. (HLW)

OTHER ENVIRONMENTAL POLLUTANT EFFECTS

45425 (NTIS/PS—78/0062) **Seafarer: impacts and studies of the extremely low frequency communication system (a bibliography with abstracts). Report for 1964—January 1978.** Lehmann, E.J. (National Technical Information Service, Springfield, Va. (USA)). Feb 1978. 176p.

Studies are cited of Government-funded research relative to the Department of the Navy global communication system using extremely low frequency (ELF) radio waves. This system has been given the name Seafarer and was previously called Sanguine. The bibliography is divided into four parts. The first covers the biological effects of ELF radiation on humans, animals, plants, and ecosystems. The second part presents research on equipment, performance, feasibility, design, and transmission. The last two sections cite surveys for the Sanguine antenna in Texas and Michigan. (This updated bibliography contains 167 abstracts, 42 of which are new entries to the previous edition.)

45426 (AD-A—048648) **Science and life. Selected articles.** Translated by R.D. Hill from *Nauka Zhizn;* 76-90(Jul 1961). 72p. (FTD-ID(RS)T—1342-77). NTIS PC A04/MF A01.

Contents: Life and Magnetic Field; Convince Themselves; Magnetic Field, Strange Irritant; Experiments in Psychomagnetism; Department of Normal Physiology; Will Magnetic Compasses be Required by the Future Astronauts; Institute of Roentgenology, Radiology and Oncology; Protection from Lethal Radiation Doses; Is the New Method of Diagnosis of Cancer Feasible; Magnetotropism Deserves Attention; English Professor's Experiments; Are More Precision Methods of Study Necessary; Physicist's Remarks and Hypothesis of Candidate of Biological Sciences.

HEALTH AND SAFETY

45427 (NUREG—0090-10) **Report to Congress on abnormal occurrences, October—December 1977.** (Nuclear Regulatory Commission, Washington, D.C. (USA). Office of Management Information and Program Control). Mar 1978. 32p. NTIS $4.50.

Section 208 of the Energy Reorganization Act of 1974 identifies an abnormal occurrence as an unscheduled incident or event which the Nuclear Regulatory Commission determines to be significant from the standpoint of public health or safety and requires a quarterly report of such events to be made to Congress. This report, the eleventh in the series, covers the period from October 1 to December 31, 1977. The following incidents or events in that time period were determined by the Commission to be significant and reportable: There were three abnormal occurrences at the 66 nuclear power plants licensed to operate. The first involved management and procedural control deficiencies. The second (a generic incident) involved a design deficiency of certain engineered safety features. The third (a generic concern) involved environmental qualifications of safety-related electrical equipment inside containment; there were no abnormal occurrences at fuel cycle facilities (other than nuclear power plants); there were two abnormal occurrences at other licensee facilities, one incident involving an occupational overexposure of a radiographer, the other an occupational overexposure at an irradiator facility.

GEOSCIENCES

GEOLOGY AND HYDROLOGY

REFER ALSO TO CITATION(S) 45359

GEOPHYSICS

SEISMOLOGY AND TECTONICS

45428 (UCRL-Trans—11367) **Crustal thickness in the island region of the Soviet Far East.** Bichevina, V.N. Translated from *Geol. Geofiz.;* No. 1, 96-106(1960). 21p. Dep. NTIS, PC A02/MF A01.

Two methods of determining the thickness of the earth's crust are proposed in the present paper: (a) the teleseismic method, using the difference in the travel times of waves (pP-pP*) reflected from the upper and lower boundaries of the crust, and (b) a method that makes it possible to determine the thickness of the crust in the region of the observing station. The latter is based on the use of the travel

time difference between transverse and converted waves (SP-S) reflected near the station from the lower boundary of the crust. The new data on crustal thickness in the Far East region are in good agreement with previous data. The paper gives a calculation of the thickness of the granitic layer at 23 points in the region using waves reflected from an internal boundary in the crust.

45429 (UCRL-Trans—11368) **Travel time curves of seismic waves for the southern Baikal region.** Golenetskii, S.I. Translated from *Geol. Geofiz.;* No. 2, 125-136(1960). 23p. Dep. NTIS, PC A02/MF A01.

A first attempt is made to determine the velocities of seismic waves for the southern Baikal region. The velocity V/sub anti S - anti p/ = 8.3 +- 0.1 km/sec and the travel time curve of these waves are established from observations of 19 earthquakes in this region (1953 to 1956) on the basis of an estimate of the maximum and minimum possible values of the velocity of fictitious S - P waves. The determination of the focal time by Wadati's method and of the epicenter from the anti S - anti P differences makes it possible to determine the travel time curves of longitudinal waves (V/sub anti p/ = 6.6 +- 0.3 km/sec) and transverse waves (V/sub anti s/ = 3.7 +- 0.2 km/sec) as a first approximation.

45430 (UCRL-Trans—11363) **Investigation of small earthquakes in Southwestern Turkmenia.** Andreev, S.S.; Masarskii, S.I.; Rustanovich, D.N.; Kharin, D.A. Translated from *Izv. Akad. Nauk SSSR, Ser. Geofiz.;* No. 2, 143-152(1954). 26p. Dep. NTIS, PC A03/MF A01.

A description is given of the data that were made the basis for compiling a map of the distribution of the epicenters of small local earthquakes in Southwestern Turkmenia according to instrumental observations for 1950 to 1952, and an interpretation of this map is offered.

45431 (UCRL-Trans—11364) **Method of isosurfaces in the interpretation of local earthquakes.** Andreev, S.S. Translated from *Izv. Akad. Nauk SSSR, Ser. Geofiz.;* No. 2, 153-159(1954). 15p. Dep. NTIS, PC A02/MF A01.

Two methods of interpreting the record of local earthquakes based on the use of time fields are presented. The methods are illustrated through examples of the processing of small earthquakes recorded in southwestern Turkmenia.

GEOPHYSICAL SURVEY METHODS

REFER ALSO TO CITATION(S) 44051, 44579

45432 (AD-A—046975) **Behavior of electric potential fields over randomly layered earth models. Doctoral thesis.** Lee, C.Y. (Colorado School of Mines, Golden (USA). Dept. of Geophysics). 19 Apr 1977. Contract N00014-76-C-0750. 122p. (T—1950). NTIS PC A06/MF A01.

Solutions are derived for the potential distributions over one-layer and two-layer random conductivity earth models for the direct current resistivity method. The random potential due to a stationary Gaussian random conductivity function in non-Gaussian and non-stationary. The ensemble and sample statistics of the random potential fields are examined. The potential field due to dipole excitation is more sensitive to variations in conductivity in the subsurface than that due to monopole excitation. Random variations in conductivity at depth are difficult to detect. Representative curves of the apparent resistivity and kernel functions are presented to show the effects of a random conductivity profile on them. These effects are appreciable and result in significant errors in the interpretation of resistivity data. However, noise of this kind is difficult to distinguish from the signal itself, especially in the presence of measurement noise. Netherless, variations in the conductivity profile should be recognized as an additional source of error in the interpretation of resistivity data.

MINERALOGY, PETROLOGY, AND ROCK MECHANICS

REFER ALSO TO CITATION(S) 44297

45433 (UCRL—80539) **Two-dimensional computer simulation of hypervelocity impact cratering: some preliminary results for Meteor Crater, Arizona.** Bryan, J.B.; Burton, D.E.; Cunningham, M.E.; Lettis, L.A. Jr. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Apr 1978. Contract W-7405-ENG-48. 59p. (CONF-780314—4). Dep. NTIS, PC A04/MF A01.

From 9. lunar science conference; Houston, TX, USA (Mar 1978).

A computational approach used for subsurface explosion cratering has been extended to hypervelocity impact cratering. Meteor (Barringer) Crater, Arizona, was selected for our first computer simulation because it was the most thoroughly studied. It is also an excellent example of a simple, bowl-shaped crater and is one of the youngest terrestrial impact craters. Shoemaker estimates that the impact occurred about 20,000 to 30,000 years ago [Roddy (1977)]. Initial conditions for this calculation included a meteorite impact velocity of 15 km/s. meteorite mass of 1.57E + 08 kg, with a corresponding kinetic energy of 1.88E + 16 J (4.5 megatons). A two-dimensional Eulerian finite difference code called SOIL was used for this simulation of a cylindrical iron projectile impacting at normal incidence into a limestone target. For this initial calculation a Tillotson equation-of-state description for iron and limestone was used with no shear strength. A color movie based on this calculation was produced using computer-generated graphics. Results obtained for this preliminary calculation of the formation of Meteor Crater, Arizona, are in good agreement with Meteor Crater Measurements.

GEOCHEMISTRY

REFER ALSO TO CITATION(S) 44146, 44209

45434 (CONF-780314—2) **Silicate petrography and origin of the mesosiderites: a preliminary investigation of their relationships to the howardite-eurite-diogenite suite.** Floran, R.J. (American Museum of Natural History, New York. Dept. of Mineral Sciences). Apr 1978. Contract W-7405-ENG-26. 34p. Dep. NTIS, PC A03/MF A01.

From 9. lunar science conference; Houston, TX, USA (Mar 1978).

Results are reported from a petrographic study of 20 mesosiderites that reveals that most contain a complex assemblage of mineral, lithic, and metal clasts. Mineral fragments dominate the clast population and consist primarily of orthopyroxene, plagioclase, and olivine.

45435 **Individual components of low-boiling (up to 125°C) hydrocarbons in organic matter of sedimentary rocks.** Shimanskii, V.K.; Shapiro, A.I.; Ivantsova, V.V. *J. Geophys. Res.;* **19**: No. 2, 195-200(Feb 1977).

Translated from Izv. Akad. Nauk SSSR, Ser. Geol.; No. 6, 114-120(1974).

The distribution of individual low-boiling hydrocarbons in organic matter of rocks is similar to the distribution of these hydrocarbons in petroleum. The greatest differences in composition of petroleum hydrocarbons and organic matter of sedimentary rocks are shown by the cycloparaffins. The cycloparaffins C_7 in organic matter, as compared with the same hydrocarbons in petroleum, have higher ratios of pentamethylenes to methylcyclohexane, ethylcyclopentane to dimethylcyclopentane, and 1,2-dimethylcyclopentane to 1,3-dimethylcyclopentane. On the whole, they are a system of isomers with lower degree of thermodynamic equilibrium than the same fractions in petroleum. This difference may be explained by the fact that the low-boiling fraction of bitumen has higher content of hydrocarbons structurally close to the "primary" products of destruction of organic matter. With increase in the degree of catagenetic transformation of organic matter as a function of thermal conditions the content of light hydrocarbons increases in it and at the same time their composition changes, the fraction of methane and aromatic hydrocarbons increases, and among the methane hydrocarbons there is an increase in the content of n-alkanes. The compasition of the light hydrocarbon fractions of petroleum reaching a reservoir is determined by the degree of transformation of organic matter from which it was formed, and is enriched accordingly in n-alkanes and arenes.

OCEANOGRAPHY

REFER ALSO TO CITATION(S) 45328

45436 (SRO—902-8) **Continental margin atmospheric climatology and sea level (Historical setting 1974—1975).** Pietrafesa, L.J.; D'Amato, R.; Gabriel, C.; Sawyer, R.J. Jr. (North Carolina State Univ., Raleigh (USA). Center for Marine and Coastal Studies). Feb 1978. Contract EY-76-S-09-0902. 300p. Dep. NTIS, PC A13/MF A01.

From the many continental shelf dynamics studies which have been made in the past decade, it has become increasingly apparent that a detailed analysis of continental margin waters can only be accomplished with an appreciation of the coastal meteorology. Fortunately, coastal meteorological and, in addition, coastal sea level data have been archived and thus provide coastal oceanographers with inexpensive, priceless and complimentary data sets. Past coastal sea level studies have demonstrated that these data contain not only tidal data but also sub-inertial frequency information which measurably details shelf reesponse to atmospheric forcing. Addition-

ally, a particular region, such as the South Atlantic Bight, can be characterized by the statistics of the temporal spectra of both data sets as well by the alonshore coherences which may exist between stations. In this study, atmospheric wind and pressure have been examined and correlated with coastal sea level changes at various coastal stations along the South Atlantic Bight.

PHYSICS RESEARCH

ASTROPHYSICS AND COSMOLOGY

COSMIC RADIATION

45437 Effect of multiple Compton scatterings on an x-ray emission spectrum. Calculations by the Monte Carlo method. Pozdnyakov, L.A.; Sobol', I.M.; Syunyaev, R.A. (Institute for Space Research, Academy of Sciences of the USSR). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 708-714(Nov 1977).

An investigation of the Compton interaction between radiation and a rarefied high-temperature plasma is of interest in connection with the discovery of cosmic bursts of x-ray and γ emission. A spherical cloud of relativistic plasma of a given scattering optical depth tau with an assigned temperature kT/sub e/=nmc² of the Maxwellian electrons is analyzed. A source of low-frequency radiation with a Planckian spectrum at a temperature T/sub r/ is placed at the center of the cloud. Calculations by the Monte Carlo method and analytical estimates showed that for a cloud of low optical depth tau<1 the outgoing radiation has a power-law spectrum I/sub γ/ ~γ/sup -alpha/, where the exponent α =logtau/log12n². For a large optical depth the spectrum becomes close to a Wien spectrum. The rate of energy loss by the cloud, its luminosity, is calculated as a function of log tau,n, and the luminosity L_0 of the source of low-frequency radiation. The problem of the passage of the hard radiation of a central source through a plasma cloud with kT/sub e/≈3 keV surrounding it is also discussed. The Monte Carlo method for the calculation of such problems is described.

45438 Fiftieth anniversary of a fundamental discovery in cosmic-ray physics. Vernov, S.N.; Dobrotin, N.A. (P. N. Lebedev Physics Institute, USSR Academy of Sciences, Moscow). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 11, 970-972(Nov 1977).

The contributions of D. V. Skobel'tsyn to the field of high energy physics are recounted. His work with the wilson cloud chamber is discussed in detail, and his influence on the discovery of the positron is noted.

STARS

REFER ALSO TO CITATION(S) 45789

45439 (N—77-34062) **Photometric study of the Orion OB 1 association. 3: subgroup analyses.** Warren, W.H. Jr; Hesser, J.E. (National Aeronautics and Space Administration, Greenbelt, Md. (USA). Goddard Space Flight Center). Oct 1977. Contract NSF C-866. 231p. (NASA-TM-X—71407; X—680-77-251). NTIS PC A11/MF A01.

The four principal subgroups of the association were examined in detail using individual distances and reddening values determined for their B type members. Subgroup 1a appeared not to show a spread in age, nor did it show a systematic distance increase with right ascension when fainter members were considered. An eastwardly increase in distance was found for subgroub 1b, but the reddening law for the east Belt appeared normal. Small subclusterings in the vicinity of the Orion Nebula appeared not to differ in the evolutionary state, but their ages were considerably greater than those of stars in the nebulae and its associated cluster.

45440 Theoretical models of 10 day Cepheids. Davis, C.G.; Davison, D.K. (University of California, Los Alamos Scientific Laboratory). *Astrophys. J.;* **221**: No. 3, 929-936(1 May 1978).

New hydrodynamic techniques coupled with improved opacities have produced light curves that can now be compared directly with the observations. A new dynamic zoning method due to J. Castor has resolved the front of the hydrogen ionization region, allowing effects due to zoning to be separated from the real effects occurring in the limited-amplitude nonlinear pulsation models. New low-temperature opacities have corrected for blanketing in the atmosphere to produce color-T/sub eff/ relationships which are in general agreement with the observations (Kraft-Oke) and a color-color loop for a 10 day Cepheid that is in good agreement with the observation of the Cepheid S Nor (Fernie).

45441 Non-Abelian gauge theories of Fermi systems: Quantum-chromodynamic theory of highly condensed matter. Baluni, V. (Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev., D;* **17**: No. 8, 2092-2121(15 Apr 1978).

A systematic perturbation theory for high-density quark gas is developed. The ground-state thermodynamic potential is evaluated up to the second order in the Gell-Mann—Low coupling α/sub s/(M). Phenomenological analysis of the resulting equation of state suggests that the neutron-quark matter phase transition occurs at neutron matter densities n/sub B/ < 2 baryon/fm³ provided 0.2 < α/sub s/ (3 GeV) < 0.3. The result supports the conjecture that superheavy steller objects may exist in the quark rather than in the neutron phase. The production of quark matter in heavy-ion collisions is also discussed briefly.

45442 Explosive nucleosynthesis, equilibrium thermodynamics, and relativistic heavy-ion collisions. Mekjian, A.Z. (Nuclear Science Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 3, 1051-1070(Mar 1978).

A description of the formation of composite nuclei observed in relativistic heavy-ion collisions is developed. The description is analogous to that used in accounting for the formation of nuclei under explosive conditions, as encountered in the expansion of an isotropic and homogeneous universe and in imploding-exploding supermassive stars. The model studied is one in which composite nuclei are formed in the space-time evolution of a rapidly expanding system of nucleons. Within the framework of this model, it is shown that reaction rates may initially be fast compared to expansion time scales, that detailed balance can then be met, and a quasi-equilibrium established for a short period of time and limited volume of space in this space-time evolution. An idealized equilibrium model is then proposed which contains a sharp cutoff from equilibrium to free expansion. In such a model the observed properties of the composite particles reflect a "frozen in" equilibrium state. A simple discussion is then presented showing that the volume at which the transition occurs is related to the finite size of the correlated structures in the system. A key result in the approach developed is that properties of the composite particle cross sections can be used to obtain information on the size of the emitting region without resorting to a Hambury-Brown—Twiss correlation measurement. Another important result is that cross sections for composite nuclei are characterized by Maxwell-Boltzmann distributions is some rest system and recent data will be discussed from this viewpoint. The thermodynamic properties of the system, such as the equation of state and the energy-temperature relationship are investigated. The effect of continuum correlations from resonances and echoes will also be discussed.

45443 Postmaximum phases of the light curves of type I supernovae. Utrobin, V.P. (Institute of Applied Mathematics, USSR Academy of Sciences, Moscow). *Sov. Astron. Lett. (Engl. Transl.);* **3**: No. 6, 275-277(Nov 1977).

In type I supernova models with gradual energy release, the envelope material should be in a state of enhanced nonequilibrium ionization after maximum light. The observed light curves imply a two-stage injection of energy, first at a power of $10^{4}4$—$10^{4}5$ erg/sec and then at $10^{4}2$—$10^{4}3$ erg/sec.

45444 Radio pulsar model. Tsygan, A.I. (Ioffe Physics and Technology Institute, USSR Academy of Sciences, Leningrad). *Sov. Astron. Lett. (Engl. Transl.);* **3**: No. 6, 289-291(Nov 1977).

A model is proposed whereby a rotating, magnetized neutron star with a surface temperature T< or ≈2×10^{40}K will be observable as a radio pulsar only if it is surrounded by neutral hydrogen (or helium). Charged particles are assumed not to be detached from the surface layer of the neutron star.

45445 Role of the H_2^+ molecular ion in the formation of stars from hot matter with a primordial chemical composition. Suchkov, A.A.; Yu. A.Shchekinov. (Institute of Physics, Rostov University). *Sov. Astron. Lett. (Engl. Transl.);* **3**: No. 6, 297-299(Nov 1977).

The H_2^+ molecular ion will evidently be the most effective cooling agent for a hydrogen—helium gas at temperatures of order 10^{40}K. It will ensure a transition to temperatures at which the cooling is governed mainly by the H_2 and HD molecules, the process ultimately controlling the mass of the stars formed from matter with a primordial chemical composition.

45446 Light curves, color curves, and expansion velocity of type I supernovae as functions of the rate of brightness decline. Pskovskii, Y.P. (Shternberg Astronomical Institute, Moscow). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 675-682(Nov 1977).

A photometric classification of supernovae is proposed, using the rate β of decline in photographic brightness after maximum light as a parameter. The principal elements of the light curves, color curves, envelope expansion velocity, and absolute magnitude at maximum light depend on the photometric class of the supernova.

The mean absolute magnitude of type I supernovae, corrected for absorption, is determined. The occurrence of the anomalous type I supernovae reported by Bertola is discussed.

45447 Origin of the intrinsic linear polarization of the optical emission of stars with infrared excesses. Dolginov, A.Z.; Mitrofanov, I.G. (A. F. Ioffe Physico-Technical Institute, Academy of Sciences of the USSR). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 715-719(Nov 1977).

The physical conditions in the gas—dust shells of giants of spectral class M having an infrared excess are discussed. The outflow of dust and gas occurs with a constant relative velocity, the density of the dust comprises (0.1—1) % of the gas density, and it varies as R⁻2. If the star's magnetic field is large (>>100 G) then dust grains near it can be oriented by the mechanism of paramagnetic relaxation. If the field is weak (but >1 G), or in the more distant regions of the circumstellar shell, the orientation arises due to the relative motion of the dust and gas under the significant influence of the magnetic field. This orientation proves to be sufficient to explain the observed linear polarization of the emission of these stars.

45448 Models of the outflowing envelopes of T Tau stars. Bisnovatyi-Kogan, G.S.; Lamzin, S.A. (Institute for Space Research, Academy of Sciences of the USSR. P. K. Shternberg State Astronomical Institute). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 720-727(Nov 1977).

A model is considered for the envelopes of T Tau stars which consists of a hot ($T \approx 10^{60}$K) corona, flowing outward radially like the solar wind and responsible for the observed excesses in the short-wavelength region, with cooler ($T \approx 2x10^{40}$K) clouds interspersed in it which move with deceleration and provide the bright hydrogen and Ca II emission lines observed in stars of this type. The cool clouds are formed in the hot outflowing corona owing to thermal instability. The observed delay of the intensity variations in the Hα line relative to those of the continuum (U filter) is determined by the time of cooling from the temperature of the corona to the temperature of the clouds. It follows from the calculations that in the given model of a T Tau star the flux of nonthermal energy generated in the dissipation of convective motions can significantly exceed the energy loss through photospheric emission. A flux of soft x-ray emission from these stars is predicted which may reach 10⁻10—10⁻11 erg/cm²xsec at the earth in the 0.2—0.28 keV range. The correspondence of the proposed model with observations is discussed and a series of observational tests is suggested for its verification.

45449 Nuclear matter with the retention of neutrinos. Vartanyan, Y.L.; Ovakimova, N.K. (Erevan State University). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 727-729(Nov 1977).

The equation of state and the chemical composition of degenerate matter (11< or =logrho (g/cm³) < or =17) in the case of the retention of neutrinos are analyzed for different initial ratios of the number of leptons to the number of baryons: 0.3< or =n/sub L//n/sub b/< or =0.5. The results in the region of densities below the nuclear density indicate a shift of nuclei of a given chemical composition into regions of higher densities and hindrance of the formation of a free neutron gas. Above the nuclear density the contribution of leptons to the pressure and to the density proves to be greater and a change is observed in the order of creation of hyperons. The possibility of the creation of gases of degenerate μ^+ mesons and free eta⁺ mesons at densities on the order of 10^{18} g/cm³ is discussed.

QUASI-STELLAR, RADIO, AND X-RAY SOURCES

45450 (LA-UR—78-1199) **Radio emission from quasars and BL Lac objects by coherent plasma oscillation and stimulated Compton scattering.** Colgate, S.A.; Petschek, A.G. (Los Alamos Scientific Lab., N.Mex. (USA)). 1978. Contract W-7405-ENG-36. 18p. (CONF-780451—1). Dep. NTIS, PC A02/MF A01.

From Conference on BL LAC objects; Pittsburgh, PA, USA (24 Apr 1978).

The full radiation spectrum of quasars and BL Lac objects is interpreted as due to a dependent combination of a soft plasma oscillation source at 2ν/sub P/ and bremsstrahlung. Previous work of the plasma oscillation radiation is extended into the radio part of the spectrum and it is shown how the high brightness temperature observations of BL Lac objects [kT/sub b/ (100 MHz) approximate = 3 x 10⁵ mc²] are a reasonable consequence of a lower external plasma density and ejection as required for the observed lack of emission lines. Two extreme cases are considered, the one where the plasma oscillations are suddenly extinguished and only stimulated Compton scattering remains and a second case of a constant source of plasma oscillations but a graded surface density. The first case gives 1/100 of the required brightness temperature and the second gives 100 times too large a brightness temperature and also a x 10 too large a radius. It is believed reasonable to invoke a combination of both processes to explain the observed radio spectrum. This model circumvents the self-Compton x-ray flux difficulty of incoherent synchrotron emission.

45451 (N—77-34092) **X-ray emitting galaxy Can-A.** Mushotzky, R.F.; Sercemitsos, P.J.; Becker, R.H.; Boldt, E.A.; Holt, S.S. (National Aeronautics and Space Administration, Greenbelt, Md. (USA). Goddard Space Flight Center). Oct 1977. 28p. (NASA-TM-X—71402; X—661-77-237). NTIS PC A03/MF A01.

OSO-8 X-ray observations of Cen-A in 1975 and 1976 are reported. The source spectrum is well fit in both years by a power law of number index 1.62 and absorption due to 1.3 x 10 ²³ at/sq cm. The total flux varied by a factor 2 between 1975 and 1976. In 1976 there were approximately 40% flux variations on a time scale of days. The 6.4 keV Fe fluorescent line and the 7.1 keV absorption edge were measured, the result implying Fe/H approximately equals .000016. Simultaneous radio measurements show variation in phase with X-ray variability. Models considering radio, milimeter, IR and X-ray data show that all the data can be accounted for by a model in which the X-rays are due to a synchrotron self-Compton source embedded in a cold H_2 cloud.

SOLAR PHENOMENA

REFER ALSO TO CITATION(S) 45473, 45478

45452 (PB—275858) **Solar—geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977—August 1977.** Coffey, H.E. (National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. (USA)). Oct 1977. 130p. (SGD—398-Pt-1).

This prompt report provides data for September 1977 on alert period, daily solar indices, solar flares, solar radio waves, coronal holes, solar x-ray radiation, solar wind measurements, inferred IP magnetic field polarities, mean solar magnetic field, and solar proton event (Provisional). It also provides data for August 1977 on daily solar activity centers, sudden ionospheric disturbances, solar radio waves, cosmic rays, geomagnetic indices and radio propagation indices.

45453 Proposed solar-neutrino experiment using ⁷1Ga. Bahcall, J.N.; Cleveland, B.T.; Davis, R. Jr.; Dostrovsky, I.; Evans, J.C. Jr.; Frati, W.; Friedlander, G.; Lande, K.; Rowley, J.K.; Stoenner, R.W.; Weneser, J. (Institute for Advanced Study, Princeton, New Jersey 08540). *Phys. Rev. Lett.;* **40**: No. 20, 1351-1354(15 May 1978).

A solar-neutrino experiment that uses ⁷1Ga as a detector can distinguish between broad classes of explanations for the discrepancy between prediction and observation in the ³7Cl experiment. A radiochemical experiment with the required amount of ⁷1Ga is feasible.

45454 Phenomenological model of solar flares. Colgate, S.A. (New Mexico Institute of Mining and Technology; and Los Alamos Scientific Laboratory). *Astrophys. J.;* **221**: No. 3, 1068-1087(1 May 1978).

In the generally accepted description, a solar flare is the release of magnetic energy. Cyclonic convection of magnetic field in a differentially rotating body is required for a dynamo. We associate the flare as part of the physics of the dynamo. The solar eddy size and eddy stress at the base of the convection zone suggest a maximum field and size for a convected twisted-flux loop. The unstable behavior os such twisted flux loops is a flare. This agrees with the observations of typical sunspots and of the very large flare of 1972 August 4. The total energy (several times 10³1 ergs) released in a time ~10³ s and volume $\pi R_0^2 L$ (length L=2.5 x 10⁹ cm, radius $R_0 = 10^8$ cm) leads to a derived magnetic field of $B_0 \approx 10^3$ gauss, current $5R_0B\theta \approx 7 \times 10^{11}$ A, and inductive potential ~10⁹ V. The plasma drift velocity of ~10⁵ cm s⁻1 and sound speed of ~8 x 10⁷ cm s⁻1 imply that the flare process is a near quasi-static and quasi-thermal steady-state dissipative flux annihilation of the parallel current density associated with a helical twisted flux tube. Classical thermal conductivity along the lines of force and the tangled-flux surface model of controlled-fusion B/sub z/ pinch experiments lead to a "buffered" steady-state electron temperature < or =2 x 10⁷ K, the almost universally observed thermal X-ray temperature. The heat is thermally conducted to the flux tube ends and is dissipated primarily by XUV-line radiation that uniquely determines a plasma equilibrium hydrostatic pressure. This is 1/10 of the photosphere pressure and of the magnetic field pressure, so the field configuration is force-free and the current density is predominantly parallel as assumed. The electron density at T =2 x 10⁷ K is n/sub e/=10¹2 cm⁻3, and this gives the correct X-ray emission measure. Heated plasma expands up the flux tube, leading to hydrostatic equilibrium in ~6 s.

45455 Shock-associated energetic proton events at large heliocentric distances. Palmer, I.D.; Gosling, J.T. (Oral Roberts University, Tulsa, Oklahoma 74171). *J. Geophys. Res.;* **83**: No. A5, 2037-2046(1 May 1978).

Enhancements of energetic protons (> or ≈0.5 MeV) in association with forward-reverse shock pairs have been observed at large heliocentric distances. An interpretation of the time profiles of

these events is offered in terms of a model of solar wind stream structure. Persistent sweeping of energetic particles by each shock front and their banking-up by reflection lead to the formation of a gradient along field lines upstream of the shocks. The rise (fall) of intensity before (after) the forward (reverse) shock is explained by a gradient in particle density directed along the upstream field lines toward the shock. A marked intensity decrease between the two shocks is interpreted in the same fashion as being due to parallel density gradients directed toward the shocks. First-order Fermi acceleration upon reflection at each highly oblique shock front offsets loss by leakage through the shock front and sustains the particle intensity in the upstream region. Other acceleration mechanisms may not be required. A simple model is explored in which the gradient profile is primarily determined by a balance between shock sweeping and diffusive flow away from the shock (it is argued that acceleration by reflection and leakage through the shock cause a secondary modification of the profile). Profiles outside the compression region in 15 observations of corotating events suggest a radial mean free path $\lambda/\text{sub } r/=0.021\rightarrow0.64$ AU (the mean is $\lambda/\text{sub } r/=0.23$ AU) over r=2.6-6 AU. The model predicts an anisotropy which upstream of each shock is lower in magnitude than observations by a factor of ≅2. The predicted direction in the upstream region is in the direction of corotation, i.e., perpendicular to the radius vector and counterclockwise in the ecliptic plane. Although net flows in this direction are observed, observations have not generally sought to distinguish upstream from downstream regions where net flows are expected to be approximately reversed.

45456 Long-term variations of selected solar wind properties: Imp 6, 7, and 8 results. Feldman, W.C.; Asbridge, J.R.; Bame, S.J.; Gosling, J.T. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *J. Geophys. Res.;* **83**: No. A5, 2177-2189(1 May 1978).

Variations in solar wind ion characteristics observed between March 18, 1971, and January 6, 1977, are presented in order to study long-term trends in large-scale interplanetary structures. Salient features observed during this period include the following. (1) Large amplitude, broad, corotating high-speed streams appeared in January 1973 and disappeared in mid-1976 and resulted in enhanced average flow speeds during this epoch of solar activity cycle 20. (2) Both proton number and total energy fluxes were generally larger after September 1972 than before August 1972. This increase is thought to result from an areal expansion of both polar coronal holes in response to the increasing polar field magnitudes and to lead to a compression of the low-speed equatorial disclike region postulated to surround the sun in interplanetary space. (3) The occurrence frequency of density enhancements not obviously produced by interplanetary compressions did not decrease with decreasing solar activity. It therefore seems unlikely that all such enhancements are caused by coronal transient events. (4) The average solar wind He abundance varied from about 3 to 5% and back to 3% during activity cycle 20. This variation lagged behind that of the smoothed sunspot number by about 1—2 years. The abundance variations, like all other known systematic solar wind ion variations, occurred preferentially during low-speed and/or high-density flow conditions. This result may be caused by a systematic time variation in the mixture of coronal flow types leading to low-speed conditions at 1 AU. Near solar maximum, energetic transient disturbances may dominate, while near solar minimum, spatially structured high-density expansions may dominate.

45457 Solar wind stream interfaces. Gosling, J.T.; Asbridge, J.R.; Bame, S.J.; Feldman, W.C. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *J. Geophys. Res.;* **83**: No. A4, 1401-1412(1 Apr 1978).

Measurements aboard Imp 6, 7, and 8 reveal that approximately one third of all high-speed solar wind streams observed at 1 AU contain a sharp boundary (of thickness less than $\sim4 \times 10^4$ km) near their leading edge, called a stream interface, which separates plasma of distinctly different properties and origins. Identified as discontinuities across which the density drops abruptly, the proton temperature increases abruptly, and the speed rises, stream interfaces are remarkably similar in character from one stream to the next. A superposed epoch analysis of plasma data has been performed for 23 discontinuous stream interfaces observed during the interval March 1971 through August 1974. Among the results of this analysis are the following: (1) a stream interface separates what was originally thick (i.e., dense) slow gas from what was originally thin (i.e., rare) fast gas; (2) the interface is the site of a discontinuous shear in the solar wind flow in a frame of reference corotating with the sun; (3) stream interfaces occur at speeds less than 450 km s^{-1} and close to or at the maximum of the pressure ridge at the leading edges of high-speed streams; (4) a discontinuous rise by ~40% in electron temperature occurs at the interface; and (5) discontinuous changes (usually rises) in alpha particle abundance and flow speed relative to the protons occur at the interface. Stream interfaces do not generally recur on successive solar rotations, even though the streams in which they are embedded often do. At distances beyond several astronomical units, stream interfaces should be bounded by forward-reverse shock pairs; three of four reverse shocks observed at 1 AU during 1971—1974 were preceded within ~1 day by stream interfaces. Our observations suggest that many streams close to the sun are bounded on all sides by large radial velocity shears separating rapidly expanding plasma from more slowly expanding plasma.

45458 Rope structure of a magnetic field rising to the solar surface. Uralov, A.M. (Institute of Terrestrial Magnetism, the Ionosphere, and Radio-Wave Propagation, Siberian Branch, USSR Academy of Sciences, Irkutsk). *Sov. Astron. Lett. (Engl. Transl.);* **3**: No. 6, 302-304(Nov 1977).

Several effects familiar in plasma physics are applied to solar magnetic fields. Piddington's recent model of an emergent magnetic flux rope splitting into strands is supported. The strong twist of some ropes could serve to break off the circulation of matter within them; a prominence would then be formed by Pikel'ner's siphon mechanism. The equilibrium of individual magnetic ropes is discussed.

45459 Magnetic fields of active regions and their zero points. Molodenskii, M.M.; Syrovatskii, S.I. (Institute of Terrestrial Magnetism, the Ionosphere, and Radio-Wave Propagation, Academy of Sciences of the USSR). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 734-741(Nov 1977).

The possibility of a potential approximation for the description of magnetic fields in the chromosphere and the corona is discussed. The introduction of a scalar potential allows one to investigate the overall geometrical properties of the field. On the basis of the results of the general theory of differential equations, it is shown that the number of singular (zero) points of a magnetic field above the plane of the photosphere is determined by the number of maxima and minima in the potential at the photosphere. The arrangement of the singular points determines the overall topological structure of the field. The Neumann problem is solved for the fields of active regions. The results of a numerical solution of the boundary problem for the active region McMath No. 11,693 are given as an example of the application of the proposed methods. The structure of the magnetic field of this region and the singular points found for it are described.

45460 Influence of plasma effects on the conditions for observing lines in the solar spectrum of radio emission. Kaplan, S.A.; Kleiman, E.B.; Oiringel', I.M. (N. I. Lobachevskii Gor'kii State University. Institute of Terrestrial Magnetism, the Ionosphere, and Radio-Wave Propagation, Siberian Branch of the Academy of Sciences of the USSR). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 742-743(Nov 1977).

In a turbulent plasma medium the atomic emission of plasma waves is more efficient than the emission of ordinary photons. This effect may be one of the causes preventing the observation of solar radio lines.

45461 Interpretation of the polarized zebra structure in solar radio emission. Zlotnik, E.Y. (Radiophysics Institute, Gor'kii). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 744-746(Nov 1977).

The polarization character of the zebra structure is explained by the properties of the nonlinear conversion into electromagnetic radiation of longitudinal waves excited in a magnetic trap owing to cyclotron instability. It is shown that depending on the concrete conditions in the generation region the bands observed in the radio emission can have either weak or strong circular polarization with a rotation sign corresponding to the ordinary wave.

45462 Some polarization features of microwave bursts on the sun. Uralov, A.M.; Nefed'ev, V.P. (Siberian Institute of Terrestrial Magnetism, the Ionosphere, and Radio-Wave Propagation, Academy of Sciences of the USSR). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 749-752(Nov 1977).

On the basis of a model of a thermal pulsed microwave burst proposed earlier by the authors the following phenomena are explained: the sign change of the polarization over the frequency range, the rapid sign change of the polarization during the development of a burst at a fixed frequency, and the noncoincidence of the times at which the maxima of the polarization and of the total flux of a burst are reached.

45463 Parameters of the solar wind responsible for plasma injection into the region of the magnetospheric ring current. Bobrov, M.S. (Astronomical Council of the Academy of Sciences of the USSR). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 758-763(Nov 1977).

The connection between the parameter q_0, which characterizes the total energy of particles injected into the region of the magnetospheric ring current per hour, and the parameters of the plasma and magnetic field of the solar wind in near-earth space ahead of the bow shock wave is studied statistically and through a comparison of time variations. The data on eight sporadic (flare-related) magnetic storms of different intensities, from moderate to very high, are used. It is found that q_0 correlates not only with the

magnitude and direction of the B/sub z/ component of the magnetic field of the solar wind normal to the ecliptic plane (intense injection being observed with a south direction of B/sub z/) but also with the variability σ/sub B/ of the total magnetic field vector. The stream velocity v of the solar wind affects the average storm intensity, although the time variations of v do not correlate with those of q_0 during any storm taken individually.

45464 Direction pattern of the microwave radio flares of the Sun. Belovskii, M.N.; Ochelkov, Y.P. (Institute of Applied Geophysics, Moscow). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 10, 540-541(Oct 1977).

The heliolongitudinal dependence of the intensity of solar flares at 8800, 4995, 2695, and 1415 MHz is discussed.

GALAXIES

45465 Infrared emission of interstellar HD molecules. Khersonskii, V.K.; Varshalovich, D.A. (Special Astrophysical Observatory, USSR Academy of Sciences, Zelenchukskaya). *Sov. Astron. Lett. (Engl. Transl.);* **3**: No. 6, 277-278(Nov 1977).

Emission coefficients ϵ/sub J/J' for rotational lines of the HD molecule are calculated for the non-LTE conditions typical of interstellar clouds. The flux density in the emission lines at $\lambda = 112$ and 56 μ is estimated.

45466 Distribution of metals among the galactic populations and the evolution of the Galaxy. Marsakov, V.A.; Suchkov, A.A. (Institute of Physics, Rostov University). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 700-705(Nov 1977).

The distribution of various types of stars and globular clusters with respect to metal abundance has two dips, dividing the entire population of the Galaxy into three groups: a disk population and two representing the conventional halo population. A similar discontinuity in the transition from old to young populations appears in the distribution of kinematic parameters. Accordingly: a) the metal enrichment of the Galaxy did not occur continuously but in bursts of activity; b) these bursts occurred during the collapse of the early Galaxy; c) star formation was inhibited during the active enrichment phases; d) during periods of star formation between activity bursts there was practically no enrichment.

COSMOLOGY

REFER ALSO TO CITATION(S) 45442

45467 (N—77-33223) **Feasibility analysis of gravitational experiments in space. Final report.** Everitt, C.W.F. (Stanford Univ., Calif. (USA). High-Energy Physics Lab.). Sep 1977. Contract JPL-954524. 35p. (NASA-CR—155148). NTIS PC A03/MF A01.

Experiments on gravitation and general relativity suggested by different workers in the past ten or more years are reviewed, their feasibility examined, and the advantages of performing them in space were studied. The experiments include: (1) the gyro relativity experiment; (2) experiments to test the equivalence of gravitational and inertial mass; (3) an experiment to look for nongeodesic motion of spinning bodies in orbit around the earth; (4) experiments to look for changes of the gravitational constant G with time; (5) a variety of suggestions; laboratory tests of experimental gravity; and (6) gravitational wave experiments.

45468 (N—77-33226) **Studies of orbital Eotvos experiments. Final report.** Chapman, P.K. (Massachusetts Inst. of Tech., Cambridge (USA). Measurement Systems Lab.). 30 Jun 1977. Contract NGR-22-009-735. 116p. (NASA-CR—155193; RE—90). NTIS PC A06/MF A01.

A direct force-balance technique was analyzed for carrying out the Eotvos experiment in space, which is intended to give sufficient sensitivity to allow investigation of the gravitational interactions of energy stored in the weak interaction. The heart of experiment is an exceedingly sensitive dual accelerometer, containing two proof masses constructed of the materials whose Eotvos ratio is to be compared. For use in development of the accelerometer, a magnetic microbalance is proposed in which the weight of the proof mass is supported by magnetic forces which vary very slowly with the proof mass position. It is shown that at least two different mechanizations of the magnetic suspension may be feasible.

45469 Fluctuations in the primordial background radiation induced by secondary ionization of matter in the universe. Syunyaev, R.A. (Institute for Space Research, USSR Academy of Sciences, Moscow). *Sov. Astron. Lett. (Engl. Transl.);* **3**: No. 6, 268-271(Nov 1977).

Secondary heating and ionization of the intergalactic gas at red shifts $z \gtrsim 10$—30 could have given the universe a large optical depth with respect to Thomson scattering, which would serve to smooth out the primordial fluctuations originating at the epoch of hydrogen recombination, $z \gtrsim 1500$. Gas motions associated large-scale density perturbations would at $z \gtrsim 10$—15 have led to the generation of secondary fluctuations in the microwave background radiation. The contribution of rich galaxy clusters and young galaxies to the background fluctuations is also estimated.

45470 Relativity of space and time finiteness—infiniteness for a matter-filled universe. Zel'manov, A.L. (Shternberg Astronomical Institute, Moscow). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 664-671(Nov 1977).

A particular Friedmann model: a model with hyperbolic comoving space filled with dustlike matter and having a zero cosmological constant: is considered in two non-comoving reference frames. A comparison of the properties and behavior of the model in three reference frames (including the comoving one) shows that such features of an expanding (or of a contracting) universe as the infiniteness or finiteness of the volume of space, of the amount of mass, and of the number of particles are not invariant: these quantities are finite in some reference frames and infinite in others. The same is true for the time elapsed from the start of the era of expansion (that is, for the "age" of an expanding universe). The relativity of spatial and temporal finiteness—infiniteness of a matter-filled world is thereby illustrated. Information is also adduced to permit a similar analysis of other cosmological models.

45471 Relativity of space finiteness—infiniteness for some Friedmann cosmological models. Kharbediya, L.I. (Tbilisi University). *Sov. Astron. AJ (Engl. Transl.);* **21**: No. 6, 672-674(Nov 1977).

In an extension of A. L. Zel'manov's analysis, new examples are given for the relativity of spatial finiteness—infiniteness in the case of Friedmann cosmological models.

45472 Gravitation, charges, cosmology, and coherence. Zel'dovich, Y.B. (Institute of Applied Mathematics, Academy of Sciences of the USSR, Moscow). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 11, 945-955(Nov 1977).

The zero-particle hypothesis of the complete evaporation of black holes is discussed.

PLANETARY PHENOMENA

45473 (N—77-34065) **Interplanetary medium data book.** King, J.H. (National Aeronautics and Space Administration, Greenbelt, Md. (USA). Goddard Space Flight Center). Sep 1977. 388p. (NASA-TM-X—72614; NSSDC/WDC-A-R/S—77-04). NTIS PC A17/MF A01.

Unresolved questions on the physics of solar wind and its effects on magnetospheric processes and cosmic ray propagation were addressed with hourly averaged interplanetary plasma and magnetic field data. This composite data set is described with its content and extent, sources, limits of validity, and the mutual consistency studies and normalizations to which the input data were subjected. Hourly averaged parameters were presented in the form of digital listings and 27-day plots. The listings are contained in a separately bound appendix.

45474 (N—77-34066) **Interplanetary medium data book, appendix.** King, J.H. (National Aeronautics and Space Administration, Greenbelt, Md. (USA). Goddard Space Flight Center). Sep 1977. 506p. (NASA-TM-X—72615; NSSDC/WDC-A-R/S—77-04A). NTIS PC A22/MF A01.

Computer generated listings of hourly averaged interplanetary plasma and magnetic field parameters are given. Parameters include proton temperature, proton density, bulk speed, an identifier of the source of the plasma data for the hour, average magnetic field magnitude and cartesian components of the magnetic field. Also included are longitude and latitude angles of the vector made up of the average field components, a vector standard deviation, and an identifier of the source of magnetic field data.

45475 (N—77-34068) **Heliocentric distance dependence of the interplanetary magnetic field.** Behannon, K.W. (National Aeronautics and Space Administration, Greenbelt, Md. (USA). Goddard Space Flight Center). Jul 1977. 92p. (NASA-TM-X—71398; X—692-77-196). NTIS PC A05/MF A01.

Recent and ongoing planetary missions have provided extensive observations of the variations of the Interplanetary Magnetic Field (IMF) both in time and with heliocentric distance from the sun. Large time variations in both the IMF and its fluctuations were observed. These are produced predominantly by dynamical processes in the interplanetary medium associated with stream interactions. Magnetic field variations near the sun are propagated to greater heliocentric distances, also contributing to the observed variablity of the IMF. Temporal variations on a time-scale comparable to or less than the corotation period complicate attempts to deduce radial gradients of the field and its fluctuations from the various observations. However, recent measurements inward to 0.46 AU and outward to 5 AU suggest that the radial component of the field on average decreases approximately as r to the minus second power,

while the azimuthal component decreases more rapidly than the r to the minum first power dependence predicted by simple theory. This, and other observations, are discussed.

45476 (N—77-34075) **Report of the terrestrial bodies science working group. Volume 2. Mercury.** Albee, A.L.; Coroniti, F.V.; Malin, M.C.; Sonett, C.P. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 15 Sep 1977. Contract NAS7-100. 29p. (NASA-CR—155188; JPL-PUB—77-51-V-2). NTIS PC A03/MF A01.

The objectives and rationale for scientific investigation of Mercury are explored. Knowledge already obtained by astronomical observations and Mariner 10 spacecraft is reviewed and measurements required for the principal scientific goals are described. The use of low thrust propulsion systems is recommended so that maximum scientific return may be achieved and the reconnaissance phase of Mercury exploration may be completed in a single mission. Accelerated development is recommended on solar electric propulsion, solar sails, passive and active cooling mechanisms, and single rough landers.

45477 (N—77-34080) **Report of the terrestrial bodies science working group. Volume 7. The Galilean satellites.** Fanale, F.P.; Beckman, J.C.; Chapman, C.R.; Coroniti, F.V.; Johnson, T.V. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 15 Sep 1977. Contract NAS7-100. 32p. (NASA-CR—155183; JPL-PUB—77-51-V-7). NTIS PC A03/MF A01.

The formational and evolutionary history of natural satellites, their mineralogical composition and other phenomena of scientific interest are discussed. Key scientific questions about IO, Ganymede, Callisto, and Europa are posed and the measurements and instruments required for a Galilean satellite lander in the 1980's are described.

45478 (N—77-34091) **Sources of magnetic fields in recurrent interplanetary streams.** Burlaga, L.F.; Behannon, K.W.; Hansen, S.F.; Pneuman, G.W.; Feldman, W.C. (National Aeronautics and Space Administration, Greenbelt, Md. (USA). Goddard Space Flight Center). Sep 1977. 45p. (NASA-TM-X—71400; X—692-77-213). NTIS PC A03/MF A01.

The sources of magnetic fields in recurrent streams were examined. Most fields and plasmas at 1 AU were related to coronal holes, and the magnetic field lines were open in those holes. Some of the magnetic fields and plasmas were related to open field line regions on the sun which were not associated with known coronal holes, this result indicated that open field lines are more basic than coronal holes as sources of the solar wind. Magnetic field intensities in five equatorial coronal holes ranged from 2 G to 18 G. Average measured photospheric magnetic fields along the footprints of the corresponding unipolar fields on circular equatorial arcs at 2.5 solar radii had a similar range and average, but in two cases the intensities were approximately three times higher than the projected intensities. The coronal footprints of the sector boundaries on the source surface at 2.5 solar radii meandered between -45 deg and +45 deg latitude, and their inclination ranged from near zero to near ninety degrees.

ATMOSPHERIC PHYSICS

45479 (N—77-33684) **Total ozone derived from uv spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights. Final report.** Hanser, F.A. (Panametrics, Inc., Waltham, Mass. (USA)). Oct 1977. Contract NAS3-20472. 93p. (NASA-CR—135276; PANA-UVS—9). NTIS PC A05/MF A01.

An ultraviolet interference filter spectrophotometer was modified to use a photodiode and was flown on latitude survey flights in the fall of 1976. Comparison with Dobson station total ozone values shows agreement between UVS and Dobson total ozone of + or - 2 percent. The procedure used to convert UVS measured ozone above the aircraft altitude to total ozone above ground level introduces an additional 2 percent deviation for very high altitude UVS ozone data. Under stable aircraft operating conditions, the UVS derived ozone values have a variability, or reproducibility, of better than + or -1 percent. The UVS data from the latitude survey flights yield a detailed latitude profile of total ozone over the Pacific Ocean during November 1976. Significant latitudinal structure in total ozone is found at the middle latitudes (30 deg to 40 deg N and S).

AURORAL AND IONOSPHERIC PHENOMENA

45480 (AD-A—047287) **Tables of ionospheric electron contant hourly values for Armidale, Australia for the period May 1970 through June 1975. Final report, 1 July 1973—30 July 1975.** Hibbard, F.H. (New England Univ., Armidale (Australia). Dept. of Physics). 14 Aug 1975. 182p. University of New England, Armidale, Australia.

Tabulations are given of hourly values of ionospheric electron content for Armidale, Australia for the period May 1970 through June 1975.

45481 (AD-A—048628) **Measurements of nitric oxide ion vibrational absorption coefficient and vibrational transfer to N_2.** Bien, F. (Aerodyne Research, Inc., Bedford, Mass. (USA)). Sep 1977. Contract F19628-76-C-0178. 31p. (ARI-RR—110.1; SCIENTIFIC—1). NTIS PC A03/MF A01.

The line locations, absorption coefficient and quenching of NO^+ vibration in the v = 1 and v = 2 by N_2 have been experimentally determined. Integrated absorption coefficients corrected for a thermal equilibrium distribution are as follows: S/sub lu/(1 - 2 P15) = 420/sq.cm./atm at 2291.63/cm and S/sub lu/(2 - 3 R2) = 653/sq.cm./atm at 2286.72/cm. Quenching of NO^+(v) by N_2 at 297 K was found to give rates of k = 2.4 times 10^{-12} cu.cm./sec for NO^+(v = 2) and k = 3.0 times 10^{-12}/cu.cm./atm for NO^+(v = 1). An estimate of 3 times 10^{-13} cu.cm./sec was found for quenching of NO^+(v = 2) by NO at 297 K. (Author)

45482 (AD-A—048752) **Morphological studies of rising equatorial Spread F bubbles. Interim report.** Ossakow, S.L.; Chaturvedi, P.K. (Naval Research Lab., Washington, D.C. (USA)). Nov 1977. 32p. (NRL-MR—3650). NTIS PC A03/MF A01.

Analytical electrodynamic morphological studies of rising equatorial Spread F bubbles, within the context of the collisional Rayleigh-Taylor regime, are presented. The analogy between bubbles (plasma density depletions) and barium clouds(plasma density enhancements) is noted. Bubbles tend to steepen on their top and elongate in the vertical direction and they narrow horizontally as they rise through the equatorial F region ionosphere. Linear and nonlinear models of constant shape bubbles are presented. It is shown for these models that the vertical bubble rise velocity, V/sub B/ = (g/upsilon/sub in/) f(delta n/n_0), where upsilon/sub in/ is the ion-neutral collision frequency and f is an increasing function of delta n/n_0 (fractional density depletion), depending on the shape of the bubble. Consequently, high altitudes and/or large percentage plasma depletions yield large vertical bubble rise velocities. The models are extended to include arbitrary electric fields in addition to the gravitational force.

45483 (N—77-33387) **Electromagnetic plasma wave emissions from the auroral field lines.** Gurnett, D.A. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). Sep 1977. Contracts NAS1-11257;NAS1-13129. 39p. (NASA-CR—155172; U-OF-IOWA—77-36). NTIS PC A03/MF A01.

The most important types of auroral radio emissions are reviewed, both from a historical perspective as well as considering the latest results. Particular emphasis is placed on four types of electromagnetic emissions which are directly associated with the plasma on the auroral field lines. These emissions are (1) auroral hiss, (2) saucers, (3) ELF noise bands, and (4) auroral kilometric radiation. Ray tracing and radio direction finding measurements indicate that both the auroral hiss and auroral kilometric radiation are generated along the auroral field lines relatively close to the earth, at radial distances from about 2.5 to 5 R sub e. For the auroral hiss the favored mechanism appears to be amplified Cerenkov radiation. For the auroral kilometric radiation several mechanisms have been proposed, usually involving the intermediate generation of electrostatic waves by the precipitating electrons.

45484 **Tordo 1 polar cusp barium plasma injection experiment.** Wescott, E.M.; Stenbaek-Nielsen, H.C.; Davis, T.N.; Jeffries, R.A.; Roach, W.H. (Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701). *J. Geophys. Res.;* **83**: No. A4, 1565-1575(1 Apr 1978).

In January 1975, two barium plasma injection experiments were carried out with rockets launched from Cape Parry, Northwest Territories, Canada, into the upper atmosphere where field lines from the dayside cusp region intersect the ionosphere. One experiment, Tordo 1, took place near the beginning of a worldwide magnetic storm. It became a polar cap experiment almost immediately as convection perpendicular to B moved the fluorescent plasma jet away from the cusp across the polar cap in an antisunward direction. Convection across the polar cap with an average velocity of more than 1 km/s was observed for nearly 40 min until the barium flux tubes encountered large E fields associated with a poleward bulge of the auroral oval near Greenland. Prior to the encounter with the aurora near Greenland there is evidence of upward acceleration of the barium ions while they were in the polar cap. The three-dimensional observations of the plasma orientation and motion give an insight into convection from the cusp region across the polar cap, the orientation of the polar cap magnetic field lines out to several earth radii, the causes of polar cap magnetic perturbations, and parallel acceleration processes.

MAGNETOSPHERIC PHENOMENA

REFER ALSO TO CITATION(S) 45473, 45474

45485 (AD-A—048432) **Energetic electrons at the synchronous altitude 1974—1977. Interim report.** Paulikas, G.A.; Blake, J.B.; Hilton, H.H. (Aerospace Corp., El Segundo, Calif. (USA). Ivan A. Getting Labs.). 8 Nov 1977. Contracts F04701-77-C-0078. 46p. NTIS PC A03/MF A01.

A description of the energetic (140 keV to > 3.9 MeV) electron environment observed at the synchronous altitude during the 1974-1977 time interval is presented. These results were obtained by an experimental carried on the geostationary ATS-6 spacecraft. Observations were made at several longitudes. Electron fluxes exhibit a complex temporal behavior ranging in time scale from a diurnal variation to a semi-annual variation. Average fluxes are computed and compared with earlier studies and models.

45486 (N—77-33737) **Electric field topology near the dayside magnetopause.** Heikkila, W.J. (Kungliga Tekniska Hoegskolan, Stockholm (Sweden). Institutionen foer Plasmafysik). Apr 1977. 31p. (TRITA-EPP—77-12). NTIS PC A03/MF A01.

A direct test for the occurrence of the reconnection electric field E sub R, tangent to the dayside magnetopause, is possible using spacecraft observations of magnetic field and plasma parameters made in situ. One particular pass of HEOS-2, on June 18, 1973, is discussed, although other passes lead to similar conclusions, without exception. The expected energization is about 1 keV per particle, but none is observed. Neither is there any evidence of an enhanced outflow as predicted by reconnection theories. The conclusion is that no reconnection electric field, tangential to the dayside magnetopause, exists; thus, the magnetopause must be very nearly an equipotential surface. The significance of this conclusion, in particular the role of the boundary layer inside the magnetopause, is discussed.

45487 Processes at the magnetotail baoundary: Comments on 'On hot tenuous plasmas, fireballs, and boundary layers in the earth's magnetotail' by L. A. Frank, K. L. Ackerson, and R. P. Lepping. Hones, E.W. Jr. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Geophys. Res.;* **83**: No. A5, 2216-2227(1 May 1978).

45488 Current-driven instabilities in a laminar perpendicular shock. Lemons, D.S.; Gary, S.P. (Physics Department, College of William and Mary, Williamsburg, Virginia 23185). *J. Geophys. Res.;* **83**: No. A4, 1625-1632(1 Apr 1978).

The linear theory of fully electromagnetic plasma instabilities driven by currents flowing across a magnetic field is investigated, with applications to the laminar perpendicular bow shock. The theory utilizes the local approximation, assumes unmagnetized ions and magnetized electrons, and includes the effects of gradients in the magnetic field magnitude and density. Oblique propagation is considered, and wave numbers may be of the order of or larger than the reciprocal electron Larmor radius. An increase in the electron beta does not significantly affect the ion acoustic instability but does reduce the growth rates of the Buneman and the modified two-stream instabilities. If T/sub e/ > > T/sub i/ within the shock, results indicate that the ion acoustic instability is the most important growing mode, for any reasonable beta. If T/sub e/ < T/sub i/ throughout the shock, further work is necessary to determine which instability is most important.

ATOMIC, MOLECULAR, AND CHEMICAL PHYSICS

45489 Rovibronic two-photon transitions of symmetric top molecules. Chen, K.; Yeung, E.S. (Ames Laboratory: U. S. Department of Energy and Department of Chemistry, Iowa State University, Ames, Iowa 50011). *J. Chem. Phys.;* **69**: No. 1, 43-52(1 Jul 1978).

Rotational line strengths of two-photon absorption (TPA) processes in symmetric top molecules in the gas phase are developed by angular momentum theory. Experimentally accessible polarization states and frequencies of the photons are considered case by case. For TPA processes of identical photon frequency, parallel linearly polarized photons and same-sense circularly polarized photons form a complete polarization study. In the absence of resonance-enhanced intermediate states, TPA of nonidentical photon frequencies normally does not give new spectral features which are forbidden in identical TPA, because of the highly unfavorable weighting factors involving the intermediate state energies. High resolution studies of TPA, especially in the Doppler-free regime where features can be further resolved, is an alternative and can be more fruitful than polarization study for excited state assignments. A more general selection rule for TPA is that the initial and final states must have identical overall rovibronic symmetry. The Jahn—Teller effect induced, j-type doubling can be probed directly by TPA. As resonance condition is approached, features of different rotational structures (ΔK selection rules) within a two-photon allowed electronic band can occur through a nonadiabatic intermediate state. The polarization ratios for near-resonant TPA, which is useful for both intermediate and final state assignments, are also presented.

45490 Photoelectron spectra of Ar_2 and Kr_2 and dissociation energies of the rare gas dimer ions. Dehmer, P.M.; Dehmer, J.L. (Argonne National Laboratory, Argonne, Illinois 60439). *J. Chem. Phys.;* **69**: No. 1, 125-133(1 Jul 1978).

The photoelectron spectra of Ar_2 and Kr_2 were determined at 584 A with resolutions of 18 and 21 meV, respectively, using an apparatus which combines a supersonic molecular beam source with a hemispherical photoelectron spectrometer. Dissociation energies were determined for the weakly bound B ^{2}Pi/sub() 3/2//sub g/ and C ^{2}Pi/sub() 1/2//sub u/ excited states of the dimer ions, and were found to average approximately 30% greater than those predicted by recent theoretical calculations. Optimum potentials were determined for the $Ar^+{}_2$ and $Kr^+{}_2$ ground states by fitting calculated Franck—Condon distributions to the observed photoelectron peaks. As in the case of $Xe^+{}_2$, the optimum $Rg^+{}_2$ potentials retain the shapes determined by theoretical calculations, but they are modified by scaling their dissociation energies to the experimentally determined values. The Morse function is shown to be an inadequate potential form for the $Rg^+{}_2$ ground states, since it is too attractive at large internuclear distance.

45491 Absolute integrated intensities of the infrared absorption bands of $TiCl_4$. Person, W.B.; Maier, W.B. II. (University of California, Los Alamos Scientific Laboratory, P. O. Box 1663, Los Alamos, New Mexico 87545). *J. Chem. Phys.;* **69**: No. 1, 297-299(1 Jul 1978).

The absolute integrated molar absorption coefficients A/sub i/ have been measured for the ν_3 fundamental and for the stronger binary combination bands of $TiCl_4$ in the vapor phase. The experimental value for A_3, the coefficient of the $TiCl_4$ ν_3 fundamental vibration, is 277 +- 42 km mole$^-$1. This value is compared with 320 +- 40 km mole$^-$1 predicted from the mean transition movement vertical-barμ/sup z/$_0$1vertical-bar≅0.29 +- 0.04 D given by Fox and Person for asymmetric X—Cl stretching vibrations of tetrahedral molecules. Another prediction, based on transfer of effective charges for the Cl atom, yields $A_3 <$ or ≈125 km mole$^-$1. The implications of these results are discussed.

45492 Radiative transition probabilities for the B ^{1}Pi—X $^1\Sigma^+$ and B ^{1}Pi—A $^1\Sigma^+$ bands of ^{7}LiH. Zemke, W.T.; Way, K.R.; Stwalley, W.C. (Department of Chemistry, Wartburg College, Waverly, Iowa 50677). *J. Chem. Phys.;* **69**: No. 1, 402-408(1 Jul 1978).

The recently reported [J. Chem. Phys. 66, 5412 (1977)] hybrid potential curves for the X $^1\Sigma^+$ and A $^1\Sigma^+$ states of LiH and the herein reported hybrid potential curve for the B ^{1}Pi state of LiH are combined with the ab initio transition moments of Docken and Hinze [J. Chem. Phys. 57, 4936 (1972)] to calculate radiative transition probabilities between all B ^{1}Pi ($v' <$ or $=2$) and all X $^1\Sigma^+$ ($v'' <$ or $=23$) and A $^1\Sigma^+$ ($v'' <$ or $=26$) vibrational levels of ^{7}LiH. The strongest single emission band found is the B ^{1}Pi ($v'=2$) → X $^1\Sigma^+$ ($v''=23$) band between the highest "long-range" levels in each potential. For all B ^{1}Pi levels the emission is dominated by B→X rather than B→A emission.

45493 Radiative lifetimes for vibrational levels of the B ^{1}Pi state of ^{7}LiH. Zemke, W.T.; Stwalley, W.C. (Department of Chemistry, Wartburg College, Waverly, Iowa 50677). *J. Chem. Phys.;* **69**: No. 1, 409-410(1 Jul 1978).

Newly calculated radiative transition probabilities for the B ^{1}Pi→X $^1\Sigma^+$ and A $^1\Sigma^+$ emission bands of ^{7}LiH (preceding paper) are used to calculate the radiative lifetime of the various vibrational levels ($0 <$ or $= v' <$ or $=2$) of B ^{1}Pi LiH. An estimate of the B→X bound—free emission probability is also included, although the lifetimes are dominated by the B→X bound—bound emission. The calculated radiative lifetimes increase rapidly with v' from 11.3 nsec at $v'=0$ to 17.0 nsec at $v'=1$ and then 24.0 nsec at $v'=2$.

45494 Rotating frame NMR relaxation study of gaseous ClF. Gillen, K.T.; Douglass, D.C.; Griffiths, J.E. (Sandia Laboratories, Albuquerque, New Mexico 87185). *J. Chem. Phys.;* **69**: No. 1, 461-467(1 Jul 1978).

This paper describes the first application of rotating frame NMR techniques to a gas phase system. Experiments were run on the linear diatomic molecule ClF at room temperature and various gas densities ranging from 13 to 28 amagat. By combining ^{19}F rotating frame results with ^{19}F spin—lattice relaxation time T/sup F/$_1$ results, values of the chlorine spin—lattice relaxation time T/sup Cl/$_1$ and the gas phase chlorine to fluorine spin—spin coupling constant J/sub FCl/ were derived. Since ClF is a linear molecule, its relaxation times, T/sup Cl/$_1$ and T/sup F/$_1$ lead directly to values of

the reorientational and angular velocity correlation times, tau/sub theta,2/ and tau/sub J/, respectively. The ratio tau/sub J//tau/sub theta,2/ is found to be equal to 1.38 +- 0.15, independent of gas density. This result is compared to various theories which relate tau/sub J/ and tau/sub theta,2/, and it is shown that none of these theories adequately describe the gas phase reorientational motions of ClF. Rotating frame and spin—lattice relaxation time measurements were also made in the liquid and plastic crystalline solid phases of ClF. The reorientational correlation times derived from this data have an Arrhenius dependence on temperature with an activation energy of 1.2 kcal/mole. In addition, the analysis indicates that the liquid phase ^{19}F to ^{35}Cl spin—spin coupling constant J/sup liq/$_{35}$ is equal to 770 +- 10 Hz; this is approximately 10% smaller than the 855 +- 10 Hz determined for J/sup gas/$_{35}$ from the gas phase experiments.

45495 Existence of the dielectric constant in fluids of nonlinear rigid polar molecules. Ramshaw, J.D. (Theoretical Division, University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Chem. Phys.;* **68**: No. 11, 5199-5202(1 Jun 1978).

The existence of the dielectric constant ϵ is investigated for fluids composed of nonlinear rigid polar molecules. The investigation is performed using the functional-derivative approach previously employed to establish sufficient conditions for the existence of ϵ in fluids of linear (axially symmetric) molecules. It is shown that these same conditions are sufficient for nonlinear molecules of arbitrary symmetry. An expression for ϵ in terms of the direct correlation function emerges automatically from the development. This expression, which involves the inversion of a 3 x 3 matrix, is a slight generalization of one obtained earlier by Hoye and Stell using an entirely different approach.

45496 Calculation of the photoionization cross section of the $^1\Sigma$/sub u/$^+$ excimer state of Ar_2. Rescigno, T.N.; Hazi, A.U.; Orel, A.E. (Theoretical Atomic and Molecular Physics Group, Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *J. Chem. Phys.;* **68**: No. 11, 5283-5284(1 Jun 1978).

The vertical photoionization profiels of the bound $^1\Sigma$/sub u/$^+$ excimer state of Ar_2 are reported.(AIP)

45497 Relativistic effects on low-energy 5s → εp photoionization for xenon. Johnson, W.R.; Cheng, K.T. (Department of Physics, University of Notre Dame, Notre Dame Indiana 46556). *Phys. Rev. Lett.;* **40**: No. 18, 1167-1170(1 May 1978).

Under suitable conditions, relativistic corrections to the interaction of photoelectron with its parent ion are enhanced, giving rise to large anisotropic final-state effects which can be observed in the photoelectron angular distribution. The particular example of 5s → εp photoionization of Xe is considered in detail. It is shown that the angular asymmetry parameter β is reduced by a factor of 9 from its nonrelativistic value of 2 near the 5s "Cooper minimum," so that the energy dependence of β becomes a sensitive test of atomic correlation theories.

45498 Exact wave-function normalization constants for the B_0 tanhz-U_0 cosh$^-$ 2z and Poeschl-Teller potentials. Nieto, M.M. (Theoretical Division, Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Rev., A;* **17**: No. 4, 1273-1283(Apr 1978).

We obtain, in exact closed form, the wave-function normalization constants for the Schroedinger equation with potential V = B_0 tanhz-U_0 cosh$^-$ 2z. These constants are derived in terms of a variety of formulations and solutions of the equation. We give discussions of both mathematical aspects and physical motivations of the problem. The main results are gathered in two appendixes. Wave-function normalization constants for the related Poeschl-Teller potential are given in a third appendix.

45499 $3d^2$—3d4f transitions in V IV. Shalimoff, G.V.; Conway, J.G. (Materials and Molecular Research Divisions, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *J. Opt. Soc. Am.;* **68**: No. 2, 267-268(Feb 1978).

Nineteen transitions from the ground configuration $3d^2$ to the 3d4f configuration and three transitions from ground to the 3d4p configurations have been observed and measured in the 378—402 Å region for vanadium IV.

BEAMS AND THEIR REACTIONS

45500 (AD-A—048751) Reflex tetrode with unidirectional ion flow. Interim report. Pasour, J.A.; Mahaffey, R.A.; Golden, J.; Kapetanakos, C.A. (Naval Research Lab., Washington, D.C. (USA)). Nov 1977. 12p. (NRL-MR—3670). NTIS PC A02/MF A01.

Experimental results are reported which show that the backward directed (and unusable) ion current in a reflex triode can be almost completely suppressed by adding a second anode, made of aluminized mylar, 0.5 cm from the existing polyethylene anode. Proton generation efficiencies in excess of 50% have been obtained.

45501 Mitigation of residual space charge ion optics effects in gas cell by adjustment of beam perveance. Whealton, J.H. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Rev. Sci. Instrum.;* **49**: No. 6, 869-870(Jun 1978).

The effect of residual space charge in the gas cell on fast neutral optics is considered. It is shown that within the paraxial approximation, the deleterious effects of this space charge may be reduced by more than a factor of 4 by lowering the beam perveance. This result is valid for a wide class of axial neutral production distributions.

45502 Production of polarized H^- or D^- ions by a colliding-beam method. Hennies, D.; Raymond, R.S.; Anderson, L.W.; Haeberli, W.; Glavish, H.F. (Department of Physics, University of Wisconsin, Madison, Wisconsin, 53706). *Phys. Rev. Lett.;* **40**: No. 19, 1234-1236(8 May 1978).

An experiment is described which shows that a 3-μA beam of polarized H^- of D^- ions can be produced by bombarding polarized thermal hydrogen atoms with a beam of 40-keV cesium atoms. The observed beam polarization is consistent with the assumption that there is no depolarization in the collision (H^0)/sub p/ol + $Cs^0 \rightarrow$ (H^-)/sub p/ol + Cs^+. The emittance of the beam is sufficiently small for good transmission through tandem accelerators.

45503 Infrared spectroscopy in supersonic molecular beams: ν_3 band of SF_6 at 10.6 μm. Kim, K.C.; Holland, R.F.; Filip, H. (Los Alamos Scientific Laboratory, P. O. Box 1663, Los Alamos, New Mexico 87545). *Appl. Spectrosc.;* **32**: No. 3, 287-289(May 1978).

A band contour analysis is shown for the ν_3 absorption of the flow-cooled SF_6. Temperature dependence of the absorption feature is simulated. The possible utility of this technique as a temperature probe of flow-cooled gas mixtures is discussed.

45504 Escape of cesium from a surface-plasma H^--ion source. Bel'chenko, Y.I.; Davydenko, V.I.; Derevyankin, G.E.; Dorogov, A.F.; Dudnikov, V.G. (Institute of Nuclear Physics, Siberian Branch, Academy of Sciences of the USSR, Novosibirsk). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 7, 282-283(Jul 1977).

It is found that the escape of Cs from a discharge chamber occurs mainly at the end of the discharge pulse.(AIP)

ATOMIC AND MOLECULAR PROPERTIES

REFER ALSO TO CITATION(S) 45174, 45548

45505 Pseudopotential study of some prominent band systems of the spectra of the I_2 molecule. Das, G.; Wahl, A.C. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *J. Chem. Phys.;* **69**: No. 1, 53-62(1 Jul 1978).

Using pseudopotential multiconfiguration self-consistent field (MCSCF) techniques several states of the I_2 molecule are studied to explain some important band systems of the spectra of iodine vapor. Spectroscopic parameters of the states X $^1\Sigma^+$/sub g/, D $^1\Sigma^+$/sub u/, B $^3\Pi_{0^+}$/sub u/" $^3\Pi$i/sub 1u/, $^3\Pi$i/sub 2u/", $^3\Pi_{0^+}$/sub g/, $^3\Pi$i/sub 1g/, $^3\Pi$i/sub 2g/ are evaluated and compared with known experimental data. Attempts are made to resolve questions in regard to the assignments of molecular states to the above band systems as well as those pertaining to the position and symmetries of various curves that have remained only partially answered over the years.

45506 Configuration interaction studies of the HeH^+ molecular ion. IV. The triplet sigma, pi, and delta states. Green, T.A.; Michels, H.H.; Browne, J.C. (Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Chem. Phys.;* **69**: No. 1, 101-105(1 Jul 1978).

The method of superposition of configurations was applied to the triplet sigma, pi, and delta states of HeH^+ which correlate to the separated atom states of principal quantum number less than or equal to 3. The calculations were done for internuclear separations, 0< or =R< or =65.5 a.u., on a mesh adequate for interpolation. Similar calculations on the singlet states have already been reported. The present calculations complete the accurate evaluation of the potential energy curves for this system which are required for low- and intermediate-energy collision studies. In addition to the energy eigenvalues and eigenfunctions, dipole, gradient, and radial coupling matrix elements were calculated for the sigma and pi states. Primarily, this paper presents information on the eigenvalues. The accuracy of the triplet-state calculations is comparable to that obtained for the singlet states. The similarities and differences in the pattern of avoided crossings for the triplet and singlet states are exhibited. These are mainly determined by the differences in the triplet and singlet energy-level schemes of the united and separated atoms.

45507 Calculations of the electronic structure and transitions of actinide metal hexafluorides. Boring, M.; Hecht, H.G. (University of

California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Chem. Phys.;* **69**: No. 1, 112-116(1 Jul 1978).

SCF-Xα-SW calculations are reported for the actinide metal hexafluorides UF_6, NpF_6, and PuF_6. Eigenvalues and charge densities analyzed according to angular momentum contributions within atomic spheres are given for the ground states, and several transitions have been calculated using the electronic transition state concept.

45508 Measurement of vibrational population distributions in a supersonic expansion of carbon monoxide. Bender, D.J.; Mitchner, M.; Kruger, C.H. (Lawrence Livermore Laboratory, Livermore, California 94550). *Phys. Fluids;* **21**: No. 7, 1073-1085(Jul 1978).

The results of an investigation of the vibrational kinetics of carbon monoxide in a supersonic expansion are presented. In the experiments, arc-heated argon was seeded with CO (5—20%) and expanded to Mach numbers of 4.0 to 4.2. The vibrational state of the gas was determined by obtaining individual vibrational populations from the CO overtone emission spectra. The vibrational distribution at the nozzle exit was observed to be non-Boltzmann, in good quantitative agreement with the anharmonic model of vibrational relaxation.

45509 Atomic diamagnetism: Quasi Landau spectrum near the ionization threshold. Fonck, R.J.; Tracy, D.H.; Wright, D.C.; Tomkins, F.S. (Physics Department, University of Wisconsin, Madison, Wisconsin 53706). *Phys. Rev. Lett.;* **40**: No. 21, 1366-1369(22 May 1978).

The positions of quasi Landau resonances as a function of magnetic field strength are reported for the first time. These resonances were observed near the ionization limit in the even-parity channels of barium and strontium with use of two-photon laser spectroscopy. The change in the resonance positions as the field strength is varied and the energy spacings of the resonances agree well with hydrogenic semiclassical theory. Resonance profiles, but not positions, are found to be species dependent.

45510 Anomalous spectral and yield features of Auger emission from symmetric molecules. Matthews, D.L.; Hopkins, F. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). *Phys. Rev. Lett.;* **40**: No. 20, 1326-1329(15 May 1978).

Proton-induced sulfur LMM and carbon KLL Auger yields from SF_6, CF_4, and CCl_4 gaseous targets are found to be substantially reduced from the corresponding yields observed using H_2S, SO_2, and CH_4. Speculations about the observed dependence on chemical species include inelastic scattering of the Auger electron during its transit out of the molecule and double Auger emission to the continuum.

45511 Precise measurements of Kα x-ray linewidths in Eu, Tm, and Ta. Wang, K.; Hahn, A.A.; Boehm, F. (California Institute of Technology, Pasadena, California 91125). *Phys. Rev., A;* **17**: No. 5, 1735-1738(May 1978).

The widths of $K\alpha_1$ and $K\alpha_2$ x rays in Eu, Tm, and Ta have been measured to an accuracy of (2—4) % with a high-resolution spectrometer by means of third- and fourth-order diffraction from the (111) crystalline planes of a bent silicon crystal. The measured values confirm the results from calculations of the radiative, Auger, and Coster-Kronig widths. Possible effects from hyperfine interaction, Coulomb exchange interaction, and chemical shift are discussed.

45512 Absorption spectrum of ytterbium vapor in the 1700—1060 A region. Kozlov, M.G.; Kotochigova, S.A.; Krylov, B.E. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 4, 368-370(Oct 1977).

The absorption spectrum of ytterbium vapor in a graphite vacuum furnace was recorded in the 1700—1060 A region with a resolution of 0.3 A. The wavelengths of 159 lines were measured, about 140 of them being new observations. Most of the lines correspond to transitions from the ground $4f^{14}6s^2S_0$ state to terms of the $4f^{14}6s^2nd$, $4f^{14}6pnd$ (ns), $4f^{14}5dnp$, and $4f^{14}6s5dnd$ (ns) configurations. The energies of the atomic ytterbium terms were determined from 59,000 cm^{-1} to 93,000 cm^{-1}. The wavelength dependence of the absorption coefficient of ytterbium vapor from 1700 A to 1060 A is given in relative units.

45513 Observation of magnetic resonance in the 1^1S_0 ground state of optically oriented ^{3}He atoms by the use of transverse modulation of the magnetic field. Dmitriev, S.P.; Zhitnikov, R.A.; Okunevich, A.I. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 4, 469-470(Oct 1977).

The absorption of a transverse beam of light of wavelength 1.08 μm is observed as evidence of a magnetic resonance in ^{3}He atoms.(AIP)

45514 Optical excitation function of the 5876-A line in helium near the threshold. Mezentsev, A.P.; Fedorov, V.L. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 3, 351-352(Sep 1977).

An electrostatic selector was used to measure the optical excitation function of the He 3^3D level.(AIP)

45515 Transfer excitation energy between n=5 levels in He I. Bagaev, S.A.; Oginets, O.V.; Smirnov, V.B.; Tolmachev, Y.A.; Nikolaeva, L.P. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 3, 353-354(Sep 1977).

The pressure dependence of the decay probability for various states of electron-beam excited He I are studied.(AIP)

45516 Possible suppression of P-odd effects in heavy atoms. Bilen'kii, S.M.; Petkov, S.T. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 649-651(Jun 1977).

We consider an $SU_2 \times U_1$ gauge theory of weak and electromagnetic interactions, in which the neutral hadron current has vector and axial parts, and the P-odd effects are suppressed in heavy atoms such as ^{209}Bi and ^{133}Cs. It is shown that the P-odd asymmetry in deep-inelastic scattering of polarized leptons by nucleons is of the same order in this model ($10^{-4}\ q^2/M^2$) as in the standard theory.

45517 NMR determination of the triton-proton magnetic moment ratio to within 10^{-6}%. Neronov, Y.I.; Barzakh, A.E. (B. P. Konstantinov Institute of Nuclear Physics, Leningrad). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 871-876(May 1977).

An NMR pulse spectrometer has been used to determine the triton and proton free precession frequencies for HT molecules in a gas to within +- 2.7 x 10^{-9} and the spin-spin interaction energy (J/sub p/T=299.3 +- 0.2 Hz). A calculation is given of the difference between the screening of the triton and the proton in HT. The calculation is based on the Fraga-Ransil ground-state wave function, and the correction antisymmetric functions are obtained by a variational method subject to the condition that the electric dipole moment of HD should be accurately described. Corrections due to mutual nuclear screening are also taken into account. Calculations have shown that the triton in HT is screened more effectively than the proton by a factor of 20.4 x 10^{-9}. The corresponding factor for the deuteron in HD is 15.0 x 10^{-9}. The final result for the magnetic moment of the triton is 1.066 639 908 +- 3 and the magnetic moment of the deuteron is 0.3070121983 +- 8 in units of the proton magnetic moment.

45518 Classical and quantum treatment of the Stark broadening of hydrogen lines. Baryshnikov, F.F.; Lisitsa, V.S. (I. V. Kurchatov Institute of Atomic Energy). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 943-949(May 1977).

The dipole approximation is used to obtain an exact quantum-mechanical solution for the Stark broadening of a hydrogen line. This solution provides an analytic description of the entire line contour. The quantum-mechanical solution is compared with the exact classical solution, and the range of validity of the latter is elucidated.

POSITRONIUM, MUONIUM, AND MUONIC AND MESIC ATOMS AND MOLECULES

45519 Effect of a laser field on the probability for muon capture in light nuclei. Batkin, I.S.; Smirnov, Y.G.; Churakova, T.A. (Voronezh State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 16-17(Jul 1977).

It is shown that the action of resonant laser radiation can alter the populations of the hyperfine-structure sublevels of μ-mesic atoms, thus altering the muon-capture probability.

45520 Radiationless mixing in kaonic atoms. Samoilov, V.M. (Institute of Theoretical and Experimental Physics, State Atomic Energy Commission). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 643-647(Jun 1977).

Radiationless mixing in kaonic atoms with strongly deformed nuclei is considered using methods based on Heitler's damping theory. An "external" mixing effect is taken into account in contrast to earlier studies. The derived expressions are used to estimate relative x-ray yields in even-even erbium isotopes.

45521 Schroedinger perturbation theory in the adiabatic representation of the three-body problem. Vinitskii, S.I.; Ponomarev, L.I. (Joint Institute for Nuclear Research). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 876-884(May 1977).

A perturbation theory for the calculation of the binding energy and the wave functions of a three-body system is developed for the problem of three bodies with Coulomb approximation. The zeroth approximation used was an adiabatic basis, i.e., solutions and terms of the two-center problem of quantum mechanics, and the kinetic energy of the relative motion of like charged particles is regarded as a perturbation. The method is illustrated with the calculation of the binding energy of the pdμ mesic molecule as an example.

COLLISION PHENOMENA

45522 Infrared fluorescence measurement of equilibrium and vibrational temperatures in laser-irradiated gases. Kleinman, L.I.; Weston, R.E. Jr.; Flynn, G.W. (Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973). *J. Appl. Phys.;* **49**: No. 8, 4328-4334(Aug 1978).

A calibrated two-color temperature method has been developed for the measurement of time-dependent temperatures in low-pressure gases following laser excitation. Ratios of ir fluorescence signals arising from specific vibrational manifolds are used to determine the magnitude of laser heating, the vibrational temperatures of individual modes, and density fluctuations due to gasdynamic expansion following spatially inhomogeneous excitation. This technique has been applied to a prototype system consisting of SF_6, SO_2, and CH_3F exposed to TEA CO_2 laser excitation of the ν_3 mode of SF_6. Prior to V-T/R relaxation, this system cannot be described by a single vibrational temperature.

45523 Photon and positive ion production from collisions of superthermal hydrogen atoms with lithium atoms and molecules. Crooks, J.B.; Way, K.R.; Yang, S.; Wu, C.R.; Stwalley, W.C. (Department of Chemistry, University of Iowa, Iowa City, Iowa 52242). *J. Chem. Phys.;* **69**: No. 1, 490-491(1 Jul 1978).

Photon and positive ion production from superthermal collisions of hydrogen atoms with lithium atoms are reported. The superthermal H atoms are collided with an intense supersonic lithium beam. The results in the 1—10 eV collision regime are reported.(AIP)

45524 Rate coefficients and inelastic momentum transfer cross sections for electronic excitation of N_2 by electrons. Cartwright, D.C. (Theoretical Division, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Appl. Phys.;* **49**: No. 7, 3855-3862(Jul 1978).

Rate coefficients, as a function of the electron temperature, have been determined from the integral cross sections for excitation of the 19 singlet and triplet electronic states of N_2 within 14.2 eV of the ground state. For electron temperatures less than 10 eV, the rates for excitation of the A $^3\Sigma^+$/sub u/, B ^{3}Pi/sub g/, W $^3\Delta$/sub u/, and a ^{1}Pi/sub g/ are all greater than that for excitation of the C ^{3}Pi/sub u/ state. The differential cross sections for excitation of these same electronic states were also used to calculate the inelastic momentum transfer associated with the excitation of these states. The total momentum transfer cross section for electrons in N_2, as a function of the electron energy, was obtained by adding the inelastic momentum transfer to that associated with elastic scattering. Inelastic momentum transfer accounts for about 25% of the total momentum transfer above 15 eV. Over the energy range 20—60 eV, inelastic scattering contributes 20—25% to the total N_2 electron scattering cross section. The total scattering cross section obtained here is in good agreement with a recent direct measurement of this cross section.

45525 Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H. Das, G.; Wagner, A.F.; Wahl, A.C. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *J. Chem. Phys.;* **68**: No. 11, 4917-4929(1 Jun 1978).

The van der Waals (VDW) forces in rare-gas hydride systems are evaluated through the use of the multiconfiguration self-consistent field (MCSCF) method. For Kr—H and Xe—H, a pseudopotential variant of the MCSCF method is used. For each system, a potential energy curve is fit to the calculated potential energies, the VDW well depth and equilibrium position are determined, and the low energy total elastic cross sections are computed as a function of relative velocity. The calculated cross sections are in good to excellent agreement, for He—H, Ar—H and Xe—H, and in fair agreement, for Ne—H and Kr—H, with the most recent experimental measurements.

45526 Collision-induced ion-pair formation of CsCl and Cs_2Cl_2 . Sheen, S.H.; Dimoplon, G.; Parks, E.K.; Wexler, S. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *J. Chem. Phys.;* **68**: No. 11, 4950-4968(1 Jun 1978).

Absolute cross sections have been determined for collision-induced ion-pair formation of cesium chloride (monomers and dimers) from collisions with Ar, Kr, and Xe atoms. The rare gas atoms were aerodynamically accelerated in H_2, with maximum energies of 6.8, 12.1, and 18.3 eV (in the laboratory frame), respectively. Time-of-flight mass spectrometry permitted the determination of partial cross sections for each ion channel resulting from the collision. For the monomer, the cross secions for the channel leading to $Cs^+ + Cl^-$ were similar in magnitude for the three rare gas atoms and were approximately 3 x $10^{-}16$ cm^2 at 3 eV above threshold. The rearrangement ionization channel leading to CsM^+ (M=Ar, Kr, and Xe) exhibited a step behavior at threshold followed by a very rapid fall off at higher collision energies. Collisions with the dimers produced both $Cs_2Cl^+ + Cl^-$ and $Cs^+ + CsCl^-_2$ but no detectable ions containing the rare gas atoms. The magnitude of the cross sections for the Cs_2Cl^+ channel varied significantly with the rare gas although the corresponding thresholds were similar. In the case of $CsCl^-_2$, however, the magnitudes of the cross sections were similar, but the thresholds varied. A possible explanation for this difference in behavior is given based on simple dynamical models. The cross sections for each product ion from both the monomer and dimer (except for CsM^+) exhibited a power-law rise with increasing energy σ=const x (E/sub tot/-E_0)/sup n//E/sub rel/ up to about 1—1.15 eV above threshold, where E/sub tot/ is the total energy, E_0 the threshold energy, and E/sub rel/ the relative kinetic energy. Values of n and E_0 were determined for each system. The threshold for each reaction $M + CsCl \rightarrow M + Cs^+ + Cl^-$ was determined most accurately from the peak in the $CsM^+ + Cl^-$ excitation function, which occurs (after energy deconvolution) at the threshold for collision-induced dissociation.

45527 Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br. Compton, R.N.; Reinhardt, P.W.; Cooper, C.D. (Chemical Physics Section, Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Chem. Phys.;* **68**: No. 10, 4360-4367(15 May 1978).

The negative ion products resulting from collisions between orthogonal beams of alkali atoms (Na, K, Cs) and the methane derivatives CH_3CN, CH_3NO_2, CF_3Br, and CF_3I have been studied in the energy range from reaction thresholds to ~40 eV (LAB). Stable negative ions with masses corresponding to the last three molecules were detected and the following electron affinities are derived from measurements of the energy threshold for the ion pair production reactions: E.A.(CH_3NO_2) =0.44/sup +0.1//sub -0.2/ eV; E.A.(CF_3Br) =0.91 +- 0.2 eV, and E.A.(CF_3I) =1.57 +- 0.2 eV. From measurements of the difference between the energy threshold for the appearance of various fragment ions and the parent ion, the following bond dissociation energies are deduced: $D(CH_3-NO^-_2)$ =0.56 +- 0.2 eV; $D(CF_3-Br^-)$ =0.54 +- 0.2 eV and $D(CF_3-I^-)$ =0.32 +- 0.2 eV. An argument is presented which adds further strength to the suggestions of Williams et al. and Jordan and Wendoloski that electron binding to CH_3CN is dominated by the dipole field.

45528 Resonance effects in the semiclassical theory of electronically nonadiabatic collision processes. Miller, W.H. (Department of Chemistry and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *J. Chem. Phys.;* **68**: No. 10, 4431-4434(15 May 1978).

Significant advances in the theory of electronically nonadiabatic collision processes have been made in recent years by the advent of models that treat all the "heavy particle" degrees of freedom: i.e., translation, vibration, and rotation: by classical mechanics; only electronic degrees of freedom are treated quantum mechanically. The "surface hopping" model of Tully and Preston and the generalized Stuckelberg model of Miller and George are examples of this type of approach. There have, however, been questions as to whether or not such models are capable of describing resonance effects in electronic—vibrational energy transfer, e.g., $A^* + BC(v=0) \rightarrow A + BC(v=1)$, with ΔE/sub A/$\simeq \hbar\omega$/sub BC/. This paper shows that these resonance effects are the result of interference of amplitudes for different classical trajectories that contribute to the transition. The Miller—George model, which incorporates interference and tunneling within the framework of classical S-matrix theory, thus describes resonance behavior, while the Tully—Preston model, which adds probabilities (rather than amplitudes) for the various trajectories, does not.

45529 Target-thickness dependence of radiative electron capture in heavy-ion collisions. Tanis, J.A.; Shafroth, S.M. (Department of Physics and Astronomy, University of North Carolina, Chapel Hill, North Carolina 27514). *Phys. Rev. Lett.;* **40**: No. 18, 1174-1177(1 May 1978).

We show how the target-thickness dependence of heavy-ion - induced x-ray production cross sections can be used to normalize the measured K REC (radiative electron capture) intensity to the fraction of incident ions with K vacancies. Experimental REC cross sections for Cl ions on Cu targets are in good agreement with the free-electron theory of Bethe and Salpeter if it is asumed that all of the M- and N-shell electron in Cu contribute to the REC process.

45530 Theoretical method for solving a two-level collision system. Arora, D.; Turner, J.E. (Division of Radiological Protection, Bhabha Atomic Research Center, Trombay, Bombay-400 085, India). *Phys. Rev., A;* **17**: No. 5, 1614-1618(May 1978).

Collisionally induced transitions between two electronic states during atom-atom collisions are described in the near-adiabatic formalism. The two-level system, in the semiclassical impact-parameter method, is represented by time-dependent coupled differential equations which have been studied by many workers. We present a method of solving the system of equations under the approximation

of slow variation of the matrix elements responsible for the transition. A general formula for the transition probability is obtained with special reference to the problem of charge transfer, though the result is applicable to other two-level systems. The formula reduces under various special conditions to other well-known expressions, such as those found by Vainshtein and co-workers, the Landau-Zener formula, and that for resonance charge transfer.

45531 Intermediate-coupling collision strengths for fine-structure transitions between S and P levels and S and D levels in highly charged He-like ions. Sampson, D.H.; Parks, A.D.; Clark, R.E.H. (Department of Astronomy, The Pennsylvania State University, University Park, Pennsylvania 16802). *Phys. Rev., A;* **17**: No. 5, 1619-1633(May 1978).

A method for obtaining scaled collision strengths $Z^2\Omega$ for highly charged ions in terms of scaled results for hydrogenic ions with $Z = \infty$ is modified by a perturbation theory approach to include the major relativistic corrections. The results are then expected to provide useful estimates for ions with Z in the range 3N < or ≈ Z < or ≈ 50, where N is the number of bound electrons per ion. Cases in which the modified approach is simplifies are considered and numerical results are given for intermediate-coupling fine-structure transitions in highly charged He-like ions involving transitions between S and P levels and between S and D levels with n < or = 5 for six or more energies. Some comparison is made with previous results of Jones.

45532 Nonstatistical population of magnetic substates of the $(1s^{-1}2p^{-1})\ ^1P_1$ state in Al. Jamison, K.A.; Richard, P.; Hopkins, F.; Matthews, D.L. (Department of Physics, Kansas State University, Manhattan, Kansas 66506). *Phys. Rev., A;* **17**: No. 5, 1642-1645(May 1978).

We have measured the polarization of the Kα′ [$(1s^{-1}2p^{-1})\ ^1P_1$] to [$(2p^{-2})\ ^1S_0$] x ray from an Al target following bombardment by various ion beams at several different incident energies. The polarization of the Kα′ x ray is a measure of the ratio of the 2p substate populations σ_1 (M/sub L/ = +- 1) and σ_0 (M/sub L/ = 0) of the $^1P_1$ state. We compare our results with recent collision-theory calculations which predict nonstatistical substate populations for simultaneous K- and L-shell ionization.

45533 Radiative collision-induced photoionization. Nayfeh, M.H.; Payne, M.G. (Chemical Physics Section, Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev., A;* **17**: No. 5, 1695-1705(May 1978).

Semiclassical expressions of two-photon ionization of atoms induced by radiative collisions are derived. The dependence of the ionization yield on the atomic forces, field intensity, and energy gap is derived. Although absorption tends to decrease as the field intensity rises due to stimulated emission at the second crossing, the two-photon ionization yield can be nearly saturated at the first crossing, thus enhancing the absorption. Both regions, ionization in single collisions and ionization between collisions, are treated. In the latter we find that saturation of the ionization can be achieved at much reduced intensities. This process promises an extremely sensitive method for studying radiative collisions, especially when absorption or fluorescence becomes extremely weak.

45534 Z, velocity, and charge dependence of zero-degree electron "cusps" from charge transfer to continuum states of bare and highly ionized projectiles. Vane, C.R.; Sellin, I.A.; Suter, M.; Alton, G.D.; Elston, S.B.; Griffin, P.M.; Thoe, R.S. (The University of Tennessee, Knoxville, Tennessee, 37916). *Phys. Rev. Lett.;* **40**: No. 15, 1020-1023(10 Apr 1978).

Data on continuum electron capture and loss for bare and highly ionizated C/sup q/+, O/sup q/+ ions traversing Ar at energies 1.6—2.8 MeV/A reveal striking disagreements with corresponding theories. We demonstrate a velocity-independent (~ Z/sup 2.2tsplus-or-minusts0.2/) scaling for continuum capture by bare ions, a Z-independent velocity scaling, and an approximately q-independent (q = 6,7,8) equality of continuum electron-capture and -loss cross sections at velocities corresponding to ~ 2 MeV/A.

45535 Born cross sections for ion-atom collisions. Gillespie, G.H.; Kim, Y.; Cheng, K. (Physical Dynamics, Incorporated, P. O. Box 556, La Jolla, California 92038). *Phys. Rev., A;* **17**: No. 4, 1284-1295(Apr 1978).

Selected total cross sections are calculated in the closure-Born approximation for the ions Li^+, Cs^+, and Au^+ incident on several gas constituents. Targets included are H, H_2, He, C, N, and O. Four general types of cross sections are considered depending on whether the incident ion or target atom is scattered elastically or inelastically. Expressions are given for the Born cross sections to the first two orders in an expansion in β^-2, where $\beta = v/c$ and v is the relative velocity. The atomic form factors and incoherent-scattering functions for the ions Cs^+ and Au^+, which are required in order to evaluate the leading-order cross-section parameters, are calculated from the relativistic and nonrelativistic Hartree-Fock wave functions. Results are also given for some of the energy moments of the dipole-oscillator-strength distributions for Cs^+ and Au^+, as determined from the ground-state wave functions. These parameters, together with atomic properties taken from the literature for Li^+ and the various targets considered are then used to evaluate the cross sections to the first two orders in the expansion.

45536 Theory of inelastic collisions between low-lying excited- and ground-state Ne atoms. Cohen, J.S.; Collins, L.A.; Lane, N.F. (Theoretical Division, Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Rev., A;* **17**: No. 4, 1343-1356(Apr 1978).

A quantum-mechanical study of low-energy inelastic collisions of excited and ground-state Ne atoms has been undertaken. Close-coupling calculations of cross sections for the transitions $^1P_1 \rightarrow {}^3P_1$, $^1P_1 \rightarrow {}^3P_2$, $^3P_1 \rightarrow {}^3P_2$, and $^3P_0 \rightarrow {}^3P_2$ have been performed at collision energies below 3 eV. All cross sections exhibit a rapid falloff at low energies, reflecting barriers and repulsive walls present in the potential curves. Spin-orbit coupling is assumed to be the transition mechanism. Comparison with experimental data suggests that neglected rotational coupling might be important for some of the quite weak transitions at energies below about 0.1 eV.

45537 Collisional excitation of interstellar molecules: H_2. Green, S.; Ramaswamy, R.; Rabitz, H. (NASA Institute for Space Studies, Goddard Space Flight Center). *Astrophys. J., Suppl. Ser.;* **36**: No. 4, 483-496(Apr 1978).

Cross sections for the important rotational transitions in molecular H_2 collisions are presented for rotational levels to j=11 and energies to 20,000 K. These have been obtained from extensive theoretical calculations. The resulting cross sections are fitted to a simple polynomial in the energy, and the coefficents are tabulated for easy utilization.

45538 Bremsstrahlung in collisions of fast electrons with atoms. Amus'ya, M.Y.; Baltenkov, A.S.; Gilerson, V.B. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 455-456(Nov 1977).

It is shown that the dynamic polarizability of an atom effects the differential bremsstrahlung cross section. Electron collisions with argon and potassium are calculated as examples.

45539 Excitation of autoionization states of LiI in electron—atom collisions. Aleksakhin, I.S.; Borovik, A.A. (Uzhgorod State University). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 487-488(Nov 1977).

Autoionization states of 58.912 and 63.358 eV were excited in Li be collision with 70-500 eV electrons. The emitted electron spectra were studied with a hemispherical electrostatic velocity analyzer.

45540 Investigation of the Ba emission spectra in the 50—90-nm region with electron impact excitation of atoms. Aleksakhin, I.S.; Bogachev, G.G.; Ugrin, S.Y. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 4, 476-477(Oct 1977).

An electron beam of current density 10^-3—10^-2 A/cm² three-electride electron gun. The vacuum ultraviolet spectra due to the excitation of Ba by these electrons was studied.(AIP)

45541 Electronic spectra of autoionization states of barium, observed in electron-atom collisions. Aleksakhin, I.S.; Borovik, A.S.; Zapesochnyi, I.P. (Uzhgorod State University). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 6, 314-317(20 Sep 1977).

Electron spectroscopy using the technique of intersecting electron and atom beams was used to study, for the first time, the spectra of electrons emitted by barium atoms. It is established that the discrete electron groups observed in the spectrum, with energies 6—16 eV, correspond to the decay of the excited autoionization states of Ba and Ba^+.

45542 Classical approximation for the ionization of a negative ion by electron impact near the threshold. Solov'ev, E.A. (Leningrad State University). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1089-1092(Jun 1977).

A classical model of the ionization of a negative ion by electron impact is considered. The interaction between the weakly-bound electron of the negative ion and the neutral core of the ion is simulated by a short-range potential. An analytic solution is obtained for incident-electron velocities lower than the velocity of the weakly-bound electron in the short-range potential. The results are compared with experimental data and with the theoretical predictions reported by other authors for the case of ionization of H^- by electron impact. The model is valid for this reaction at incident-electron energies of 4—20 eV.

45543 Excitation of autoionization states by electrons near the threshold. Ostrovskii, V.N. (Leningrad State University). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1092-1098(Jun 1977).

The theory of the interaction of a slow quantum particle with a system having an autoionization state is considered. The theory is used to describe a recently observed phenomenon [P. J. Hicks et al., Vacuum 24, 573 (1974)], namely "interaction after the collision" in the excitation of an autoionization state of an atom by an electron. The roles of various quantum effects in the formation of the resonant structure and in the spectra of the electrons and in the excitation functions of the Rydberg states of the atom are investigated. The possibility of further refining the theory is discussed.

ATOMIC AND MOLECULAR THEORY

45544 (BNL—24136) **GAUSSIAN 76: an ab initio molecular orbital program.** Binkley, J.S.; Whiteside, R.; Hariharan, P.C.; Seeger, R.; Hehre, W.J.; Lathan, W.A.; Newton, M.D.; Ditchfield, R.; Pople, J.A. (Brookhaven National Lab., Upton, N.Y. (USA)). [nd]. Contract EY-76-C-02-0016. 104p. Dep. NTIS, PC A06/MF A01.

Gaussian 76 is a general-purpose computer program for ab initio Hartree-Fock molecular orbital calculations. It can handle basis sets involving s, p and d-type gaussian functions. Certain standard sets (STO-3G, 4-31G, 6-31G*, etc.) are stored internally for easy use. Closed shell (RHF) or unrestricted open shell (UHF) wave functions can be obtained. Facilities are provided for geometry optimization to potential minima and for limited potential surface scans.

45545 **Theoretical absorption spectra of ArKr.** Bender, C.F.; Winter, N.W. (Theoretical Atomic and Molecular Physics Group, Lawrence Livermore Laboratory, Livermore, California 94550). *Appl. Phys. Lett.;* **33**: No. 1, 29-31(1 Jul 1978).

We present the results of ab initio calculations for the $ArKr^+$ potential-energy curves. The curves and calculated transition moments have been used to calculate the cross section for absorption from the bound ground state. After including spin-orbit interaction, two strong absorptions are predicted with peak cross sections and wavelengths of 1.3 x 10^-16 cm^2 at 295 nm and 4.8 x 10^-18 cm^2 at 376 nm. The 295-nm absorption band has a cross section of 1.5 x 10^-17 cm^2 at the 248-nm wavelength of KrF.

45546 **Effects of molecular rotation and vibration—rotation interaction on collisionless multiple-photon excitation of SF_6.** Cantrell, C.D.; Fox, K. (Theoretical Division, University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Opt. Lett.;* **2**: No. 6, 151-153(Jun 1978).

The effects of molecular rotation and vibration—interaction and thermally excited vibrational states on the collisionless multiple-photon excitation (CMPE) of SF_6 are calculated numerically, using preliminary vibrational anharmonic parameters derived from recent spectroscopid data. This is the first calculation of CMPE in SF_6 employing the rotational energy levels and transition moments appropriate for a spherical-top molecule. Our calculated multiphoton threshold for CMPE in SF_6 is lower by orders of magnitude than the threshold calculated without rotations. We have also made a tentative assignment of one transition in the $\nu_3 \rightarrow 2\nu_3$ spectrum of SF_6.

45547 **Effects of magnetic sublevel degeneracy on Rabi oscillations.** Shore, B.W. (Lawrence Livermore Laboratory, University of California, Post Office Box 808, Livermore, California 94550). *Phys. Rev., A;* **17**: No. 5, 1739-1746(May 1978).

This paper describes the dynamics of multilevel excitation by coherent radiation, in the N-level rotating-wave approximation, when the levels have nonzero angular momentum J and consequent spatial-orientation degeneracy 2J + 1. Observable populations average over 2J + 1 independent sublevel excitation sequences. The phenomenon of inaccessible sublevels is noted, as is the effect of polarization. The paper illustrates how averaging over orientation can, in some cases, render illegible the Rabi oscillations and the ac Stark effect, whereas in other cases (J → J, circular polarization on J → J +- 1 linear polarization) appreciable structure remains.

45548 **Regularities in s-electron binding energies in l/sup N/s/sup M/ configurations.** Rajnak, K.; Shore, B.W. (University of California, Lawrence Livermore Laboratory, P.O. Box 808, Livermore, California 94550). *J. Opt. Soc. Am.;* **68**: No. 3, 360-367(Mar 1978).

We present a theoretical explanation for observed regularities in s-electron binding energies in l/sup N/s^2 and l/sup N/s: viewed as a function of N, the curves form straight lines, joined continuously at the half-filled shell. The change in slope can be interpreted as an effective exchange integral G/sub l/(l, s). We show that values of the exchange integral obtained from fitting ionization-energy curves generally agree with values obtained in other ways.

GENERAL FLUID DYNAMICS

45549 (LBL—7204) **Small-amplitude periodic sloshing modes of a liquid in a vertical right circular cylinder with a concave spheroidal bottom.** Albright, N.; Concus, P. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Nov 1977. Contract W-7405-ENG-48. 79p. Dep. NTIS, PC A05/MF A01.

The small-amplitude periodic sloshing modes of a liquid in a vertical right circular cylinder with a concave spheroidal bottom are calculated for the case in which there is not sufficient liquid to cover the bottom entirely. Equilibrium free surfaces of the liquid were calculated by the program CAPIL for the case in which the ratio of the minor and major semi-axes of the spheroidal bottom was 0.724. Perturbations about these surfaces were calculated by the program SLOSH. For the fill heights that were studied, and to the accuracy of these calculations the same critical Bond number, B/sub crit/, was found for instability of the free surface as was found in the static analysis of Concus and Karasalo for the same test problem. Furthermore, and in agreement with their calculation, no equilibrium surfaces were found for this problem for fill heights greater than 0.503 and for Bond numbers B < B/sub crit/ < 0. For fill heights ranging from 0.20 to 0.45, unstable equilibrium surfaces were found for a range of Bond numbers, B/sub conv/ < or = B < B/sub crit/. Frequencies or growth rates were calculated for numerous equilibrium surfaces. Growth rates of the maximally unstable modes were calculated for fill height 0.30 and various Bond numbers. 12 figures, 27 tables.

45550 (N—77-33990) **Nonlinear electrostatic ion cyclotron waves in an rf-plugged inhomogeneous plasma slab.** Ikemura, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jan 1977. 48p. (IPPJ—275). NTIS PC A03/MF A01.

A theory based on the fluid and perturbation theories was developed to analyze a nonlinear electrostatic ion cyclotron wave excited in an rf-plugged inhomogeneous plasma slab by applying a pair of external potentials at its boundaries. The potential forms of the fundamental and the nonlinear second harmonic were found. In the core region of the slab, the electric field created by the fundamental potential can approximately be regarded as a dipole field. Under the stricter condition micron approximately 1, a dipole-like electric field can also be excited in the entire region for the case of high density and weak nonlinearity.

45551 (N—77-33995) **Experimental study on self-modulation of ion plasma oscillations.** Honzawa, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Feb 1977. 29p. (IPPJ—280). NTIS PC A03/MF A01.

The self-modulation of externally amplitude-modulated ion plasma oscillations was investigated. Oscillations were excited by applying an rf voltage with a frequency near the ion plasma frequency to a grid being a wall of the plasma container. The envelopes of such oscillations were observed to break up into several spikes if their amplitudes were above a value. Individual spikes thus formed were found to have similar properties to those of envelope solutions. The number of spikes per group was observed to depend strongly on various parameters. Frequency spectra of excited oscillations were studied over various amplitudes of the applied rf voltage. Comparison of these experimental results with theoretical ones indicates that the self-modulation of oscillations observed here occurs due to the modulational instability.

MAGNETOHYDRODYNAMICS

REFER ALSO TO CITATION(S) 44903

SUPERFLUIDITY

45552 **Possible new superfluidity mechanism for a He^3 film on a metal surface.** Shevchenko, S.I. (Physicotechnical Institute of Low-Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 10, 651-652(Oct 1977).

A new superfluid state in a ^{3}He film on a metal surface is predicted, which is due to pairing of the ^{3}He atoms with the metal electrons.

45553 **Wave propagation in fluids with a nonlinear friction—velocity relationship (in the example of He II).** Adamenko, I.N. (State University, Khar'kov). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 8, 463-469(Aug 1977).

The propagation of sound is discussed for a continuum in which the friction force differs for positive and negative values of the oscillatory particle velocity. This asymmetry is created by a nonlinear velocity dependence of the friction force. It is shown that the sound wave in this case has an unusual space—time dependence.

The latter, in particular, produces mass transfer of the fluid. An example of such a fluid in which the indicated effect has actually been observed is superfluid helium. The results are compared with experimental data. A comparison of this kind can yield information, in particular, about the relaxation times of the processes responsble for the cutoff of superfluid motion.

45554 Interaction between first and second sound in He^3-He^4 solutions. Lebedev, V.V. (L. D. Landau Institute of Theoretical Physics). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1169-1172(Jun 1977).

Formulas are derived for the vertices describing the interaction between first and second sound in He^3-He^4 solutions in the hydrodynamic approximation by the Hamiltonian technique. Parametric excitation of second sound by first is analyzed.

45555 Investigation of singularities in superfluid He^3 in liquid crystals by the homotopic topology methods. Volovik, G.E.; Mineev, V.P. (L. D. Landau Institute of Theoretical Physics, USSR Academy of Sciences; Institute of Solid State Physics, USSR Academy of Sciences). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1186-1196(Jun 1977).

Various singularities in the superfluid He^3 are considered: vortices, disgyrations, pointlike singularities, vortices with ends, singular surfaces, and particle-like states, as well as disclinations in cholesteric liquid crystals. A classification is presented of the topologically stable singularities. The methods of homotopic topology are used and are described with examples of well known systems such as superfluid He II, an isotropic ferromagnet, and a nematic liquid crystal. The possibility of applying these methods to ordinary crytals and to liquid crytals of the smectic type is discussed.

OTHER QUANTUM FLUIDS

45556 One-dimensional Kapitza conductance: Comparison of the phonon mismatch theory with computer experiments. Lumpkin, M.E.; Saslow, W.M.; Visscher, W.M. (Department of Physics, Texas AandM University, College Station, Texas 77843). *Phys. Rev., B;* **17**: No. 11, 4295-4302(1 Jun 1978).

We present the analog of te Khalatnikov theory for the Kapitza conductance h/sub kappa/ at the boundary between two dissimilar classical one-dimensional harmonic chains of atoms. We then perform steady-state molecular-dynamics computer experiments to determine h/sub kappa/ directly. The phonon mismatch theory gives only order of magnitude agreement with the computer experiments. Preliminary calculations indicate that anharmonicity increases the Kapitza conductance.

PARTICLE INTERACTIONS AND PROPERTIES - EXPERIMENTAL

45557 Search for fractionally charged particles in sea water, ocean sediment deposits, and volcanic lava. Ogorodnikov, D.D.; Samoilov, I.M.; Solntsev, A.M. (I. V. Kurchatov Atomic Energy Institute). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 857-860(May 1977).

The particles sought are extracted from matter by thermal desorption, accumulated by application of an electric field, and then identified. Upper limits for the concentration of quarks determined from the measurements for various materials studied lie in the range 5×10^{-28}—6×10^{-25} quarks/nucleon.

45558 Search for +1/3e fractional charges in Nb, W, and Fe metal. Schiffer, J.P.; Renner, T.R.; Gemmell, D.S.; Mooring, F.P. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., D;* **17**: No. 9, 2241-2244(1 May 1978).

The possibility is explored that the recent result of LaRue et al. on fractional charges in Nb spheres, and earlier negative results from quark searches would be reconciled if a + 1/3e quark were stable. Such particles would be loosely bound in most metals and would diffuse readily. Nb, W, and Fe filaments were heated in a 1-MV terminal and positively charged particles accelerated into a Si detector. From each filament fewer than ~ 10 particles of such charge seem to be emitted below 600 °C, giving an upper limit of ~ $10^{-}22$ per nucleon, an order of magnitude below the value implied by the result of LaRue et al.

ELECTROMAGNETIC INTERACTIONS

45559 Azimuthal correlations of high—transverse-momentum π^0 pairs. Cobb, J.H.; Iwata, S.; Palmer, R.B.; Rahm, D.C.; Rehak, R.; Stumer, I.; Fabjan, C.W.; Fowler, E.C.; Mannelli, I.; Mouzourakis, P.; Nakamura, K.; Nappi, A.; Struckzinski, W.; Willis, W.J.; Goldberg, M.; Horwitz, N.; Moneti, G.C.; Kourkoumelis, C.; Resvanis, L.K.; Filippas, T.A.; Lankford, A.J. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev. Lett.;* **40**: No. 22, 1420-1423(29 May 1978).

We have studied correlations between two π^0's produced at the CERN intersecting storage rings, utlizing detectors with large azimuthal acceptance. We find that the previously observed enhancement of two π^0's produced at azimuthal difference near 180^0 can be made to vanish when certain kinematic effects are removed. However, we observe aligned configurations above 8 GeV of transverse energy unexplained by such kinematic effects.

45560 Measurements of the photon total cross section on protons from 18 to 185 GeV. Caldwell, D.O.; Cumalat, J.P.; Eisner, A.M.; Lu, A.; Morrison, R.J.; Murphy, F.V.; Yellin, S.J.; Davis, P.J.; Egloff, R.M.; Franklin, M.E.B.; Luste, G.J.; Martin, J.F.; Prentice, J.D.; Nash, T. (University of California, Santa Barbara, California 93106). *Phys. Rev. Lett.;* **40**: No. 19, 1222-1225(8 May 1978).

The photon total cross section on protons has been measured with high precision in the Fermilab tagged-photon beam for photon energies from 18 to 185 GeV. The cross section decreases to a broad minimum near 40 GeV, and then rises by about 4 μb over the remainder of the range. A rho + ω + phi vector-dominance model (normalized to low-energy data) falls below the high-energy results by 2 to 6 μb, suggesting a contribution from charm-anticharm states.

45561 Observartion of $\mu 3\pi$ events in e^+e^- annihilation. Jaros, J.A.; Abrams, G.S.; Alam, M.S.; Barbaro-Galtieri, A.; Boyarski, A.M.; Briedenbach, M.; Chinowsky, W.; Dorfan, J.M.; Ely, R.; Feldman, G.J.; Feller, J.M.; Fong, A.; Gobbi, B.; Goldhaber, G.; Hanson, G.; Johnson, A.D.; Kadyk, J.A.; Kwan, B.P.; Lecomte, P.; Litke, A.; Lueke, D.; Lueth, V.; Madaras, R.J.; Martin, J.F.; Miller, D.H.; Nguyen, H.K.; Parker, S.I.; Paterson, J.M.; Perl, M.L.; Peruzzi, I.; Piccolo, M.; Pun, T.P.; Rapidis, P.A.; Ronan, M.T.; Ross, R.R.; Scharre, D.L.; Schwitters, R.F.; Tanenbaum, W.; Trippe, T.G.; Trilling, G.H.; Vuillemin, V.; Yount, D.E. (Stanford Linear Accelerator Center and Department of Physics, Stanford University, Stanford, California 94305). *Phys. Rev. Lett.;* **40**: No. 17, 1120-1123(24 Apr 1978).

We have observed events of the type $\mu^{+-} + (3\pi)^{+-}$ in e^+e^- interactions at center-of-mass energies above 6 GeV. The properties of the events are consistent with their coming from the heavy-lepton decays tau → μνnu-bar and tau-bar → nu-bar3π or tau-bar → nu-bar4π. The three-charged-pion invariant-mass distribution shows a significant peak at a mass 1.1 GeV/c^2. We find the branching ratio into three charged and any number of neutral pions B (tau$^+$ → nu-bar$\pi^+\pi^+\pi^-$ nπ^0) = 0.18 +- 0.065.

45562 Electroproduction of single pions at low ε and a measurement of the pion form factor up to $Q^2 = 10$ GeV^2. Bebek, C.J.; Brown, C.N.; Holmes, S.D.; Kline, R.V.; Pipkin, F.M.; Raither, S.; Sisterson, L.K.; Browman, A.; Hanson, K.M.; Larson, D.; Silverman, A. (High Energy Physics Laboratory, Harvard University, Cambridge, Massachusetts 02138). *Phys. Rev., D;* **17**: No. 7, 1693-1705(1 Apr 1978).

We report measurements of the electroproduction of single charged pions from hydrogen and deuterium targets for values of ε in the range $0.35 < \epsilon < 0.45$. Data were taken with a hydrogen target at the (W,Q^2) points (2.15 GeV, 1.2 GeV^2), (2.65, 2.0), (2.65, 3.4), (2.65, 6.0), and (2.65, 10.0). Data were taken with a deuterium target at the (W, Q^2) points (2.15, 1.2) and (2.65, 2.0). The transverse cross section obtained by using these data in conjunction with earlier data at high ε to separate the longitudinal and transverse components is used in conjunction with the new data and the t-channel Born term to determine the pion form factor and to re-evaluate previously reported measurements. In the range $0.15\ \text{GeV}^2 < Q^2 < 10.0\ \text{GeV}^2$ the pion form factor can be described by the simple pole form $[1 + Q^2/(0.462 +- 0.024)]^- 1$.

45563 Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV. Asaturyan, V.M.; Grigoryan, E.O.; Vartapetyan, G.A. ; Danagulyan, A.S.; Demekhina, N.A.; Khudaverdyan, A.G. (Erevan State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 601-604(Jun 1977).

Photonuclear reactions in the targets ^{27}Al, ^{28}Si, ^{31}P, ^{32}S, and ^{40}Ca have been studied for maximum bremsstrahlung energies of 2, 2.4, 3, and 4.5 GeV. The yields of the residual nuclei ^{7}Be, ^{11}C, ^{13}N, ^{18}F, ^{22}Na, and ^{24}Na were measured by means of a germanium-lithium semiconductor detector with a sensitive volume of 30 cm^3. In discussion of the results we took into account the contribution of the low energy part of the bremsstrahlung spectrum. Comparison of the measured yields with estimates calculated by Rudstam's formula permitted us to conclude that there is a difference in the mechanism of formation of the light fragments ^{7}Be, ^{11}C, and ^{13}N from that of the other residual nuclei ^{18}F, ^{22}Na, and ^{24}Na.

WEAK INTERACTIONS

45564 Inelastic muon-neutron scattering: Charged-hadron multiplicities and prong cross sections. Bunnell, K.; Duong-van, M.; Mozley, R.; Odian, A.; Villa, F.; Wang, L.C.; del Papa, C.; Dorfan, D.; Flatte, S.M.; Heusch, C.A.; Lieberman, B.; Moss, L.; Schalk, T.; Seiden, A. (Stanford Linear Accelerator Center, Stanford, California). *Phys. Rev., D;* **17**: No. 11, 2847-2852(1 Jun 1978).

Based on approximately 10 000 inelastic muon scatters in a liquid deuterium target, we extract charged-hadron multiplicities and topological cross sections for events off the neutron in a range 0.3 < or = Q^2 < or = 4.5 GeV^2, 2.0 < or = W < or = 4.6 GeV. We find no significant changes in the multiplicity or topological fractional cross sections over the Q^2 range of our experiment. Empirically the average multiplicity off a neutron target is equal to that off a proton target over the Q^2 and W range of our experiment.

45565 Baryonic decays of the psi (3095). Peruzzi, I.; Piccolo, M.; Alam, M.S.; Boyarski, A.M.; Breidenbach, M.; Feldman, G.J.; Hanson, G.; Jaros, J.A.; Lueke, D.; Lueth, V.; Lynch, H.L.; Paterson, J.M.; Pun, T.P.; Rapidis, P.A.; Richter, B.; Schindler, R.H.; Schwitters, R.F.; Siegrist, J.; Tanenbaum, W.; Goldhaber, G.; Johnson, A.D.; Abrams, G.S.; Chinowsky, W.; Kadyk, J.A.; Madaras, R.J.; Nguyen, H.K.; Trilling, G.H.; Wiss, J.E. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev., D;* **17**: No. 11, 2901-2914(1 Jun 1978).

We have measured the branching ratios for a number of psi (3095) decay modes involving protons or Λ's. We present an analysis of the properties of these final states, which provides information on psi (3095) quantum numbers and the presence of resonances in the final states.

45566 Experimental mean y values and intergrated structure functions for neutrino and antineutrino scattering at high energy. Barish, B.C.; Bartlett, J.F.; Bodek, A.; Brown, K.W.; Buchholz, D.; Chu, Y.K.; Sciulli, F.; Siskind, E.; Stutte, L.; Fisk, H.E.; Krafczyk, G.; Nease, D.; Fackler, O. (California Institute of Technology, Pasadena, California 91125). *Phys. Rev. Lett.;* **40**: No. 22, 1414-1417(29 May 1978).

We present measurements of < y > for deep-inelastic charged-current distributions with incident neutrino and antineutrino energies ranging from 45 to 205 GeV. The neutrino values show little energy dependence, while the antineutrino data indicate a 10% rise over this energy range. Integrated structure functions obtained from our total-cross-section and < y > results are also discussed.

45567 Diffractive production of vector mesons in high-energy neutrino interactions. Bell, J.; Berge, J.P.; Bogert, D.V.; Cence, R.J.; Coffin, C.T.; Diamond, R.N.; DiBianca, F.A.; Endorf, R.; French, H.T.; Hanft, R.; Harris, F.A.; Jones, M.; Kochowski, C.; Louis, W.C.; Lynch, G.R.; Malko, J.A.; Marriner, J.P.; Moffatt, G.I.; Nezrick, F.A.; Parker, S.I.; Peters, M.W.; Peterson, V.Z.; Roe, B.P.; Ross, R.T.; Scott, W.G.; Seidl, A.A.; Smart, W.; Stenger, V.J.; Stevenson, M.L.; Velde, J.C.V.; Wang, E. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Phys. Rev. Lett.;* **40**: No. 19, 1226-1229(8 May 1978).

Results for diffractive production of vector mesons in high-energy neutrino-proton interactions are presented. Diffractive production of rho$^+$ is observed with a cross section of (8 +- 3) x 10$^-$40 cm^2 in agreement with recent theoretical predictions. Upper limits for A_1^+ and B^+ production are presented. The limit for B^+ production are presented. The limit for B^+ production gives a new limit on the contribution of weak second-class currents.

45568 Measurement of $\Sigma^- \to \Lambda e^- \nu$ and $\Xi^- \to \Lambda e^- \nu$ branching ratios. Herbert, M.L.; Cleland, W.E.; Cooper, W.E.; Dris, M.; Engels, E. Jr.; Kraus, D.E.; Thompson, J.A.; Lowenstein, D. (University of Pittsburgh, Pittsburgh, Pennsylvania 15250). *Phys. Rev. Lett.;* **40**: No. 19, 1230-1233(8 May 1978).

In the Brookhaven National Laboratory 20.8-GeV/c negative hyperon beam, we have measured the branching ratios ($\Sigma^- \Lambda e^- \nu$)/$\Sigma^- \to n\pi^-$) and ($\Xi^- \to \Lambda e^- \nu$)/($\Xi^- \to \Lambda\pi^-$). From a total of 10^6 Ξ^- topology triggers, of which 7.5 x 10^5 have an electron Cerenkov counter in coincidence, we find 127 summation$^-$ $\Lambda e^- \nu$ candidates and 15summation$^-$ $\to \Lambda e^- \nu$ canadidates including about 4% background for $\Sigma^- \to \Lambda e^- \nu$ and about 30% background for summation$^-$ $\to \Lambda e^- \nu$. We measure the branching ratios to be (0.60 +- 0.06) x 10$^-$4 ad (0.31 +- 0.11) x 10$^-$3, respectively.

45569 Neutral-current coupling in high-energy neutrino interactions. Merritt, F.S.; Barish, B.C.; Bartlett, J.F.; Bodek, A.; Brown, K.W.; Buchholz, D.; Jacquet, F.; Sciulli, F.J.; Stutte, L.; Suter, H.; Fisk, H.E.; Krafczyk, G. (California Institute of Technology, Pasadena, California 91125). *Phys. Rev., D;* **17**: No. 9, 2199-2205(1 May 1978).

We present measured hadron energy distributions for the reactions ν (nu-bar) + N $\to \nu$ (nu-bar) + hadrons at high energy, as well as for the similar charged-current interactions. Insofar as possible, the determination of these distributions avoids any a priori assumptions about either the neutral-current or the charged-current interactions. We further analyze the neutral-current distributions within the framework of specific models, particularly the scaling model, to obtain a positive-helicity component P = 0.36 +- 0.10, which lies between pure V - A and pure V or A, and a coupling strength of g_0 = 0.31 +- 0.03 relative to the charged-current interaction. These coupling parameters agree well with the predictions of the Weinberg-Salam model with sin$^2\theta$/sub W/ = 0.33 +- 0.07.

45570 Measurement of the neutral-current interactions of high-energy neutrinos and antineutrinos. Wanderer, P.; Benvenuti, A.; Cline, D.; Imlay, R.; Reeder, D.D.; Stefanski, R.; Rubbia, C.; Sulak, L.; Messing, F.; Ford, W.T.; Ling, T.Y.; Mann, A.K. (Department of Physics, University of Wisconsin, Madison, Wisconsin 53706). *Phys. Rev., D;* **17**: No. 7, 1679-1692(1 Apr 1978).

Measurements of the ν and nu-bar weak hadronic neutral-current total cross sections and hadron energy distributions are consistent with a V - A form for this current. They are three standard deviations from pure V, pure A, or a pure T form and unambiguously exclude V + A and any linear combination of S and P.

45571 Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber. Baranov, D.S.; Volkov, G.G.; Gershtein, S.S.; Ivanilov, A.A.; Konyushko, V.I.; Korablev, V.M.; Korotkov, V.A.; Kuznetsov, E.P.; Makeev, V.V.; Nikitin, Y.P.; Parshikura, S.N.; Polyarush, A.Y.; Ryabov, Y.G.; Smirnov, Y.I.; Sokolov, A.A.; Yarba, V.A. (Institute of High Energy Physics, Serpukhov). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 57-62(Jul 1977).

The neutrino experiment in the SKAT chamber has recorded the formation of a heavy short-lived neutral particle with a mass 1.4< or =m< or =2.5 GeV/c^2 and a lifetime tau~6 x 10$^-$12 sec. The event can be interpreted as the production and decay of a heavy lepton according to the scheme $M^0 \to \mu^- + e^+ + \nu$/sub e/. The mass of the M^0 is as follows: 1.4< or =m/sub M/0< or =2.1 GeV/c^2. We have not excluded the probability of interpretation of the event as single production in a nondiagonal neutral current of a charmed particle $D^0 \to e^+ + \pi^- + \nu$/sub e/ ($D^0 \to K^0 + e^+ + \pi^+ + \nu$/sub e/) with mass 1.4< or =m/sub D/0< or =2.5 GeV/c^2. The probability of interpretation of the observed event as reactions of associative production of charmed particles or a reaction with production of kaon pairs in a neutral current is rather small (<3 x 10$^-$3 events). It is shown that the probability of explanation of the observed event by accidental superposition of known processes or different events is extremely low (<2 x 10$^-$5 events).

STRONG BARYON-INDUCED INTERACTIONS

45572 Central collisions produced by relativistic heavy ions in nuclear emulsion. Heckman, H.H.; Crawford, H.J.; Greiner, D.E.; Lindstrom, P.J.; Wilson, L.W. (Lawrence Berkeley Laboratory and Space Sciences Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 5, 1651-1664(May 1978).

We have performed an experimental study of the angular and momentum distributions of fragments emitted from central collisions between emulsion nuclei (AgBr) and heavy-ion projectiles ^{4}He, ^{16}O, and ^{40}Ar at beam rigidity 5.72 GV. Central collisions are here defined as interactions that exhibit an absence of projectile fragmentation, i.e., no beam-velocity fragments are produced within 5^0 of the incident beam direction. Production angles have been measured for all fragments having a restricted gain density g > or = 2g/sub min/, corresponding to protons of E < or = 250 MeV. Both range and angle measurements have been made for fragment ranges < or = 4 mm, corresponding to protons of E < or = 31 MeV. The data are analyzed in terms of a modified Maxwell-Boltzmann distribution from which we obtain estimates of the longitudinal velocity β/sub parallel/ and the characteristic spectral volocity β_0 of the particle-emitting systems. We find that no unique Maxwellian distribution can account for the observed fragment distributions. The angular distributions do not display statistically significant structure attributable to collective phenomena.

45573 p-^{4}He elastic scattering at 5.75 GeV/c. Nasser, M.A.; Gazzaly, M.M.; Geaga, J.V.; Hoistad, B.; Igo, G.; McClelland, J.G.; Sagle, A.L.; Spinka, H.; Carroll, J.B.; Perez-Mendez, V.; Whipple, E.T.B. (Department of Physics, University of California, Los Angeles, California 90024). *Phys. Rev., C;* **17**: No. 5, 1748-1751(May 1978).

A measurement of dσ/dt between t = 0.18 and 2.2 (GeV/c)^2 has been made at a bombarding energy of 4.89 GeV. The shallow minimum observed between 0.4 and 2.68 GeV persists. The magnitude of dt/dt is intermediate between those measured at 2.68 GeV and at 23.1 GeV; dσ/dt exhibits a change in slope near - t = 1.0 (GeV/c)^2, corresponding to the interference of double and triple scattering amplitudes.

45574 Energy Dependence of Opaqueness for pp Collisions at High Energies. Chou, T.T. (Department of Physics and Astronomy, University of Georgia, Athens, GVeorgia). *Found. Phys.;* **8**: No. 5, 319-328(May 1978).

Opaqueness of pp collisions is evaluated at three CERN-ISR energies. Comparisons with predictions of the factorizable eikonal models and the scaling hypothesis are made. It appears that results are in favor of the factorizable models.

45575 Correlations between two hadrons at large transverse momenta. Fisk, R.J.; Engelmann, R.J.; Good, M.L.; Ito, A.S.; Joestlein, H.; Kaplan, D.M.; Kephart, R.D.; McCarthy, R.L.; Wahl, H.; Herb, S.W.; Hom, D.C.; Lederman, L.M.; Sens, J.C.; Snyder, H.D.; Yoh, J.K.; Appel, J.A.; Brown, B.C.; Brown, C.N.; Innes, W.R.; Ueno, K. (State University of New York at Stony Brook, Stony Brook, New York 11794). *Phys. Rev. Lett.;* **40**: No. 15, 984-987(10 Apr 1978).

We have studied the interactions of 400-GeV/c protons with beryllium nuclei and observed hadrons produced at large transverse momenta (p/sub perpendicular/) back to back near 90° in the proton-nucleon center-of-momentum system. When both transverse momenta exceed about 2.6 GeV/c, we observe that the probability per single hadron of observing a second high-p/sub perpendicular/ hadron on the opposite side approximately scales in the ratio of the two transverse momenta (x/sub e/ scaling). Quantum-number correlations between the opposite-going high-p/sub perpendicular/ hadrons are weak.

45576 Test of charge-conjugation invariance in p-barp interactions. Cester, R.; Fitch, V.L.; Kadel, R.W.; Webb, R.C.; Whittaker, J.D.; Witherell, M.S.; May, M. (Department of Physics, Princeton University, Princeton, New Jersey 08540). *Phys. Rev., D;* **17**: No. 7, 1706-1708(1 Apr 1978).

Using p-barp interactions at $\sqrt{s} = 5.44$ GeV we have tested for evidence of C noninvariance through a comparison of the transverse-momentum distributions of particle and antiparticle produced at 90° in the center of mass. We found an average charge asymmetry for pions with p/sub perpendicular/ between 0.5 and 2.7 GeV/c of Δ = (N/sub +/ - N/sub -/)/(N/sub +/ + N/sub -/) =0.006 +- 0.009. This corresponds to a limit on the magnitude of the C-violating (relative to C-conserving amplitude) of Reα < or = 0.0045.

45577 Polarization parameter for nucleon-nucleon elastic scattering at 11.8 GeV/c. Kramer, S.L.; Ayres, D.S.; Cohen, D.; Diebold, R.; Pawlicki, A.J.; Wicklund, A.B. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., D;* **17**: No. 7, 1709-1712(1 Apr 1978).

Data are presented on the polarization parameter in pp and pn elastic scattering at 11.8 GeV/c for four-momentum transfers -t = 0.15 to 0.9 GeV². In contrast to lower energies where the pn polarization is positive, it is slightly negative at 11.8 GeV/c; averaging the data from - t = 0.18 to 0.5 GeV² we find P (pn) = (- 0.9 +- 0.5) %, to be compared with P (pp) = (5.6 +- 0.8) %. These data, combined with our previous data at lower energies, show that the I = 0 single-flip exchange amplitude has an anomalously rapid energy dependence.

45578 Search for magnetic monopoles at the CERN Intersecting Storage Rings. Carrigan, R.A. Jr.; Strauss, B.P.; Giacomelli, G. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Phys. Rev., D;* **17**: No. 7, 1754-1757(1 Apr 1978).

In a search for magnetic monopoles produced in high-energy pp collisions, a series of metallic collectors was exposed at an intersection region of the CERN Intersecting Storage Rings to an integrated luminosity Lt ≅ 7.2 x 10^37 cm^-2. The search was sensitive to poles with a mass m/sub g/ < or ≈ 30 GeV. For m/sub g/ < 20 GeV, the search yielded an upper-limit cross section of σ < 1.3 x 10^-37 cm² (95% confidence level) for 0.2 < or ≈ g < or ≈ 1.2 Dirac magnetic charges; for 1.2 < g < 24 the limit is σ < or ≈ 4 x 10^-37 cm².

45579 Particles emitted backward in the lab in hadron-nucleus interactions at > or ≈1 TeV. Azaryan, M.O.; Zazyan, M.Z.; Mamidzhanyan, E.A. (Erevan Physics Institute). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 72-74(Jul 1977).

Experimental data on nucleon-nucleus interactions, obtained in 1970—1973 by means of the big ionization calorimeter at the Aragats mountain station, are analyzed in order to confirm the existence of the "backward current" effect and to calculate it quantitatively at energies > or ≈1 TeV. The cross section for the backward current is measured. A comparison is made with the accelerator data. The angular distribution of backward particles is estimated and formula are presented for determination of the multiplicity of backward particles.

45580 Isotopic dependence of the yield of ^{17}N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn. Batist, L.K.; Berlovich, E.E.; Mezilev, K.A.; Novikov, Y.N. (Leningrad Institute of Nuclear Physics, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 605-607(Jun 1977).

Cross sections have been measured for production of ^{17}N in bombardment by 1-GeV protons of targets of /sup 24,25,26/Mg, / sup 32,34/S, /sup 40,44/Ca, /sup 58,62,64/Ni, and /sup 112,116,119,120,122,124/Sn. It is shown that the isotopic dependence of the ^{17}N yield is determined by the variation of the relative excess of neutrons (N-Z)/A of the target nucleus, both for the deep spallation reaction and for fragmentation reactions.

STRONG MESON-INDUCED INTERACTIONS

45581 Meson production by Δ exchange in π^-p interactions at 4 GeV/c. Scharre, D.L.; Chapman, J.W.; Ely, R.P.; Gidal, G.; Michael, W.; Oddone, P. (Lawrence Berkeley Laboratory and Department of Physics, University of California, Berkeley, California 94720). *Phys. Rev., D;* **17**: No. 11, 2853-2863(1 Jun 1978).

A streamer-chamber spectrometer is triggered by fast forward protons from 4-GeV/c π^-p interactions at the Bevatron. Meson-resonance production in the backward, I/sub u/ = 3/2 exchange reactions π^-p → pM$^-$ are studied, where M$^-$ refers to π^-, rho$^-$, A$^-_1$, A$^-_2$, and B$^-$. Elastic scattering and rho$^-$ production are observed and discussed in detail. No backward A$^-_1$, A$^-_2$, or B$^-$ production is observed at the level of approximately 5 μb.

45582 s-dependence of proton fragmentation by hadrons. II. Incident laboratory momenta 30—250 GeV/c. Weisberg, H.; Beier, E.; Brody, H.; Patton, R.; Raychaudhuri, K.; Takeda, H.; Thern, R.; Van Berg, R. (Accelerator Department, Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., D;* **17**: No. 11, 2875-2887(1 Jun 1978).

Measurements of inclusive scattering in the target-fragmentation region are extended to higher incident energy. The combined data set shows departures from an approach to the asymptotic scaling limit as A + Bs/sup -1/2/ that are significant even at the highest energies. When these departures are taken into account, the data approach a limit that is consistent with equal cross sections induced by particles and antiparticles and with Pomeron factorization. The corrections to A + Bs/sup -1/2/ are so large that detailed tests of Mueller-Regge relationships are not conclusive.

45583 Total cross section of the reaction K$^-$p → K-bar^{0}n from 515 to 1065 MeV/c. Alston-Garnjost, M.; Kenney, R.W.; Pollard, D.L.; Ross, R.R.; Tripp, R.D.; Nicholson, H.; Ferro-Luzzi, M. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., D;* **17**: No. 9, 2216-2225(1 May 1978).

We report the results of a precise measurement of the K$^-$p → K-bar^{0}n cross section between 515 and 1065 MeV/c in steps of 10 MeV/c. The statistical errors are less than 1%, a major improvement in accuracy over previous work. We discuss in detail the experimental apparatus and the corrections made to the data. No evidence is found for the new I = 1 K-barN resonances at 546 and 602 MeV/c K$^-$ momenta reported recently by Carroll et al.

45584 Differential cross section of the reaction K$^-$p → K-bar^{0}n from 515 to 956 MeV/c. Alston-Garnjost, M.; Kenney, R.W.; Pollard, D.L.; Ross, R.R.; Tripp, R.D.; Nicholson, H. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., D;* **17**: No. 9, 2226-2240(1 May 1978).

The differential cross section for the charge-exchange reaction K$^-$p → K-bar^{0}n has been measured at 22 incident momenta between 515 and 956 MeV/c. Experimental results and Legendre-polynomial fits to the data are presented.

45585 Hybrid-bubble-chamber study of nucleon diffractive dissociation in 14-GeV/c π^{+-}p collisions. Chadwick, G.B.; Carroll, J.T.; Chaloupka, V.; Ballam, J.; Bouchez, J.; Herquet, P.; Linglin, D.; Moffeit, K.C.; Stevens, R.; Davidson, V.; Firestone, A.; Nagy, F.; Peck, C.; Rosenfeld, L.; Ely, R.; Grether, D.; Oddone, P. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev., D;* **17**: No. 7, 1713-1730(1 Apr 1978).

Two experiments to study the low-mass diffractive enhancement recoiling against a fast forward pion from π^+p and π^-p collisions at 14 GeV/c are described. Photographs of the SLAC 40-in. hydrogen bubble chamber were triggered by a downstream spectrometer when the missing mass, calculated on-line, was above 1.1 GeV. Evidence for a nonresonant mass peak at 1.35 GeV is presented, as well as for production of resonances at about 1.5 and 1.68 GeV. The data are presented as distributions in mass and momentum transfer, as well as moments and isocline plots of the decay angular distributions. Model-independent features are emphasized.

45586 Production of J/Psi particles by 43-GeV/c π^- mesons on the nuclei Be, Cu, and W. Antipov, Y.M.; Bezzubov, V.A.; Budanov, N.P.; Bushnin, Y.B.; Gorin, Y.P.; Denisenko, A.A.; Denisov, S.P.; Ech, F.A.; Klimenko, S.V.; Lebedev, A.A.; Lednev, A.A.; Mikhailov, Y.V.; Petrukhin, A.I.; Polovnikov, S.A.; Roinishvili, V.N.;

Stoyanova, D.A. (Institute of High Pressure Physics). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 414-417(5 Oct 1977).

The A-dependence of the cross section for the production of J/Psi particles by 43-GeV/c π^- mesons is measured. It is found that σ= (18 +- 6) A/sup 0.92plus-or-minus0.06/ nb/nucleus in the region x >0.

45587 Study of the invariant structure function of the reaction $\pi^- p \rightarrow \gamma^+ xxx$ at 5 GeV/c. Amaglobeli, N.S.; Budagov, Y.A.; Valkar, S.; Vinogradov, V.B.; Volod'ko, A.G.; Dzhelepov, V.P.; Dubinski, Y.; Lomakin, Y.F.; Martinska, G.; Moroz, L.G.; Rumyantsev, V.S.; Salukvadze, R.G.; Flyagin, V.B.; Kharzheev, Y.N.; Chiladze, B.G.; Sandor, L.; Shoshiashvili, S.S. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 62-65(Jul 1977).

The invariant differential cross section f (x,p/sub perpendicular/) of the reaction $\pi^- p \rightarrow \gamma^+ xxx$ at 5 GeV/c was measured in a broad range of x and p/sub perpendicular/. An approximating formula is found for f (x,p/sub perpendicular/). It is shown that the function f (x,p/sub perpendicular/) is not factorizable in the variables x and p/sub perpendicular/. In some regions of phase space scale-invariant (scaling) behavior of the differential cross section is observed. Analysis of the asymmetry of the longitudinal momentum spectrum of the photons indicates that the production mechanisms of neutral and charged pions are similar in the central region. The results of the analysis are in qualitative agreement with the predictions of the quark model of hadrons.

45588 Transverse momentum correlations of identical pions from 40-GeV/c π^- p interactions. Angelov, N.; Akhababyan, N.O.; Grekova, L.D.; Kopylov, G.I.; Penev, V.N.; Trayanov, R.; Shklovskaya, A.I. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 66-68(Jul 1977).

Data on the transverse-momentum correlations between like-charged pions are obtained, and on the basis of these data the transverse dimension of the region from which identical pions are emitted is found to be R=1.0 +- 0.1 F. The dependence of the value obtained for R on the position of the pions on the rapidity scale is investigated.

45589 Two-particle correlations of charged particles and photons in pion-nucleon interactions at 40 GeV/c. Angelov, N.; Backovic, S.; Grekova, L.; Grishin, V.G.; Dzhmukhadze, S.V.; Didenko, L.A.; Ivanovskaya, I.A.; Inogamova, T.Y.; Kanarek, T.; Kladnitskaya, E.N.; Lyubimov, V.B.; Lyutov, S.I.; Mel'nikova, N.N.; Nagy, J.; Nazargulov, R.M.; Nikitina, V.F.; Popova, V.M.; Solomin, A.N.; Semerdzhiev, K.I.; Solov'ev, M.I.; Suleimanov, M.; Tuvdendorzh, D.; Fadeev, N.G.; Tsiitsivadze, E.T.; Shklovskaya, A.I.; Shcheglova, L.M. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 68-72(Jul 1977).

Experimental data on two-particle rapidity correlations of charged particles produced in 40-GeV/c π^-n interactions are presented. The behavior of the correlation functions R (y_1*,y_2*) and C (y_1*,y_2*) indicates the presence of close correlations in the central region. Study of the azimuthal correlations revealed correlations in the $\pi^- \pi^-$ systems due to particle identity. Experimental data on the azimuthal correlations of $\gamma\pi^-$ and $\gamma\pi^+$ systems in pion-nucleon interactions are also presented. The experimental data are compared with the results of phase-space and multiperipheral-model calculations.

45590 Cross sections of strange particle production in π^- p interactions at 5 GeV/c. Budagov, Y.A.; Vinogradov, V.B.; Volod'ko, A.G.; Karamyan, Z.K.; Kirakosyan, Z.A.; Lomakin, Y.F.; Flyagin, V.B.; Sandor, L.; Chiladze, B.G. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 635-638(Jun 1977).

We report the results of measurements of the cross sections of π^-p interactions at p/sub pi-/=5.0 GeV/c leading to the formation of V^0 particles accompanied by π^0 mesons and photons. The procedure developed has made it possible to determine the cross sections of reactions in which a large number of neutral particles and photons are produced.

45591 Semi-inclusive π^-N reactions at 40 GeV/c. Anon(Alma-Ata—Budapest—Bucharest—Warsaw—Dubna—Krakow—Moscow—Sofia—Tashkent—Tbilisi—Ulan-Bator—Hanoi Collaboration). (I 1385Hd). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 638-643(Jun 1977).

Semi-inclusive π^- p, π^- n, and π^- ^{12}C interactions at 40 GeV/c are analyzed and the properties of the secondary particles (π^{+-} mesons and photons) are examined. It is found that the structure functions for the π^{+-} mesons and photons in the central region depend only weakly on the nature of the target (p,n, or ^{12}C). The charged-secondary-multiplicity dependences of the structure functions in the fragmentation regions are discussed for π^- p, π^- n, and π^- ^{12}C interactions. The transverse-momentum distributions of the secondary particles are also analyzed.

PARTICLE INTERACTIONS AND PROPERTIES - THEORETICAL

GENERAL

REFER ALSO TO CITATION(S) 45441

45592 Instantaneous approximation for a gauge theory with dressed vertices. Celmaster, W.; Henyey, F.S. (University of California, San Diego, La Jolla, California 92093). *Phys. Rev., D;* **17**: No. 12, 3268-3272(15 Jun 1978).

We consider a Bethe-Salpeter kernel consisting of one gluon propagating between two dressed quark-gluon vertices. In order to derive the corresponding nonrelativistic potential to O ((v/c)^2) we find that it is necessary to choose a special gauge in which the time-time component of the propagator is instantaneous (to that order). The resulting Fermi-Breit potential including an anomalous magnetic moment is presented and compared with previous results.

45593 Hadronic Y production, parton distributions, and quantum chromodynamics. Owens, J.F.; Reya, E. (Department of Physics, Florida State University, Tallahassee, Florida 32306). *Phys. Rev., D;* **17**: No. 11, 3003-3009(1 Jun 1978).

Using the combined version of light-quark (qq-bar → bb-bar) and gluon-gluon (gg → bb-bar) fusion mechanisms for hadronic Y (9.5) production, we give predictions for x/sub F/ distributions using pion and proton beams, and for various total-cross-section beam ratios. In addition, we make a detailed comparison of counting-rule—like nucleonic and pionic parton distributions with those predicted by dynamical quantum-chromodynamics (QCD) calculations, and give analytic parametrizations of their QCD x and Q^2 dependence.

45594 Hamiltonian formulation of non-Abelian gauge fields and nonrelativistic bound states. Feinberg, F.L. (Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev., D;* **17**: No. 10, 2659-2686(15 May 1978).

For fermions minimally coupled to non-Abelian gauge fields, first-order quantization in the radiation gauge is presented in which the validity of naive Ward identities simplifies the renormalization procedure. Then, successive Foldy-Wouthuysen transformations are used to determine the nonrelativistic Hamiltonian operator as well as its first relativistic correction. This operator expansion is verified to all orders of perturbation theory by an extension of the Appelquist-Carazzone decoupling theorem. Next, the Hamiltonian, which provides a systematic starting point for any nonrelativistic calculation, is used to cast the fermion-antifermion nonrelativistic bound-state kernel into a simple and compact form which is spin independent and serves as the basis of a perturbative analysis. Through two loops, calculation of the kernel reveals that a mass-independent static potential exists in the nonrelativistic limit only for singlet states of the gauge group. Higher-loop corrections, three-fermion bound states, and nonperturbative methods are also discussed.

45595 Decays of the Y' and the structure of the resonances at 10 GeV. Cahn, R.N.; Ellis, S.D. (Physics Department, University of Michigan, Ann Arbor, Michigan 48104). *Phys. Rev., D;* **17**: No. 9, 2338-2341(1 May 1978).

An analysis of the structure of the new narrow resonances near 10 GeV by analogy to the psi'-psi system is shown to lead to rather surprising conclusions. Either the linear-potential-model analysis of charmonium is inapplicable to the new particles and the new resonances strongly decouple from $\pi\pi$ and eta or there are two new quarks, probably with equal charges.

45596 Calculating the electron mass in terms of measured quantities. Barr, S.M.; Zee, A. (Joseph Henry Laboratories, Princeton University, Princeton, New Jersey 08540). *Phys. Rev., D;* **17**: No. 7, 1854-1861(1 Apr 1978).

We construct a class of models in which the electron mass can be calculated in terms of the fine-structure constant, the muon mass, and the Weinberg angle. We obtain m/sub e//m/sub μ/ = N ($\alpha/\pi\sin^2\theta$/sub W/) where N is a pure number of order 1 which depends on the specific model. (There are corrections to this formula which depend on parameters of the model, but which can be made arbitrarily small by arranging certain exotic gauge bosons to be heavy.) We show that within this class of models it is possible to obtain agreement with neutral-current data and the experimental value of m/sub e//m/sub μ/.

45597 Structure of elementary particles and relationships between the different forces of nature. Arbuzov, B.A.; Logunov, A.A. (Institute of High Energy Physics, Serpukhov). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 11, 956-969(Nov 1977).

A review is present of the classification of and the relationships among the elementary particles. Strong interactions are diss-

cussed from the point of view of the quark-parton model while the unified gauge model is applied to weak and electromagnetic interactions.

ELECTROMAGNETIC INTERACTIONS

45598 Electroproduction of low hadronic masses. Olsson, M.G.; Osypowski, E.T.; Monsay, E.H. (Physics Department, University of Wisconsin, Madison, Wisconsin 53706). *Phys. Rev., D;* **17**: No. 11, 2938-2954(1 Jun 1978).

A model satisfying analytic, unitary, and soft-meson requirements is found to account for all electroproduction data in the Δ (3,3) region even at very high photon momentum transfers. The Δ, pion, and nucleon axial-vector form factors are discussed within the framework of this simple yet accurate model.

45599 Electromagnetic backgrounds in neutrino-produced trimuon events. Smith, J.; Vermaseren, J.A.M. (Institute for Theoretical Physics, State University of New York at Stony Brook, Stony Brook, New York 11794). *Phys. Rev., D;* **17**: No. 9, 2288-2297(1 May 1978).

We discuss the electromagnetic production of $\mu^+\mu^-$ pairs in neutrino-induced reactions. The cross section for ν/sub μ/ + N → μ^- + μ^- + μ^+ + X is calculated, using a quark-parton model for the photon-hadron interaction, and is ~ 0.3 x 10^-4 of the normal inclusive cross section for ν/sub μ/ + N → μ^- + X. The precise value depends upon the neutrino spectrum and experimental cuts. We present several distributions which exhibit characteristic features expected from this electromagnetic process. Corresponding reactions involving e^+e^- pairs are also studied because such events should be seen rather easily in bubble-chamber experiments. We also give some results for antineutrino-induced interactions leading to $\mu^+\mu^+\mu^-$ events.

45600 Semiclassical sum rules. Quigg, C.; Rosner, J.L. (Fermi National Accelerator Laboratory, P. O. Box 500, Batavia, Illinois 60510). *Phys. Rev., D;* **17**: No. 9, 2364-2368(1 May 1978).

The expression vertical-barPsi/sub n/(0) vertical-bar^2 = (2μ)/sup 3/2/E/sub n//sup 1/2/(dE/sub n//dn)/4π^2, relating the square of the nth s-wave wave function at the origin to the bound-state reduced mass μ and the excitation energy E/sub n/, is derived semiclassically. The relation is then used to obtain several sum rules for electron-positron annihilation and an expression for the contribution of a given flavor of heavy quark to the photon-nucleon total cross section.

45601 SU(3) x U(1) gauge theory of weak and electromagnetic interactions. Lee, B.W.; Shrock, R.E. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Phys. Rev., D;* **17**: No. 9, 2410-2448(1 May 1978).

We describe an SU(3) x U(1) gauge theory of weak and electromagnetic interactions and study its experimental implications. In this theory all nonsinglet fermions are assigned to triplet representations of SU(3). The theory satisfactorily accounts for the trimuon events recently observed in neutrino reactions. Furthermore, the model naturally ensures quark-lepton and e-μ universality, absence of right-handed currents in β and μ decay, and absence of s-d neutral currents to order G/sub F/α. Various discrete symmetries play an important role in maintaining these properties. The model allows for μ- and e-type lepton-number nonconservation at a naturally strongly suppressed level. The weak contributions to the anomalous magnetic moments of the electron and muon are calculated and shown to be in accord with experimental bounds. The predictions of the model for most neutral-current reactions are in good agreement with the data on these processes. Other features of the theory include the prediction of an absolutely stable massive neutral lepton, the absence of a sizable high-y anomaly in antineutrino charged-current reactions, and the absence of large parity violation in heavy atoms.

45602 Radiative decays of the psi (3684) into high-mass states. Tanenbaum, W.; Alam, M.S.; Boyarski, A.M.; Breidenbach, M.; Feldman, G.J.; Hanson, G.; Jaros, J.A.; Larsen, R.R.; Lueke, D.; Lueth, V.; Lynch, H.L.; Paterson, J.M.; Perl, M.L.; Peruzzi, I.; Piccolo, M.; Pun, T.P.; Rapidis, P.; Richter, B.; Schindler, R.H.; Schwitters, R.F.; Siegrist, J.; Vannucci, F.; Trilling, G.H.; Whitaker, J.S.; Abrams, G.S.; Chinowksy, W.; DeVoe, R.G.; Friedberg, C.E.; Goldhaber, G.; Johnson, A.D.; Kadyk, J.A.; Madaras, R.J.; Nguyen, H.K.; Pierre, F.M.; Sadoulet, B.; Wiss, J.E. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev., D;* **17**: No. 7, 1731-1749(1 Apr 1978).

Results of studies of radiative decays of the psi (3684) using the SLAC-LBL magnetic detector at the electron storage ring SPEAR are presented. There are three high-mass states produced in psi (3684) radiative decays, with masses of 3414 +- 3, 3503 +- 4, and 3551 +- 4 MeV where the errors given do not include an overall mass-scale uncertainty of +- 4 MeV. There is some evidence for a fourth such state at either 3455 or 3340 MeV. The branching ratio for psi (3684) radiative decay into the state at 3414 MeV is found to be (7.5 +- 2.6%). The decay modes of these states into hadrons and into γpsi (3095) are studied, yielding information about the branching ratios, spins, and parities of the states. The results are interpreted in the charmonium picture of the high-mass states.

45603 Deep-inelastic neutral-current cross sections. Budny, R.; Hagiwara, T. (Rockefeller University, New York, New York 10021). *Phys. Rev., D;* **17**: No. 7, 1758-1762(1 Apr 1978).

We derive expressions for deep-inelastic neutral-current cross sections in terms of charged-current cross sections and the first moment of electroproduction structure functions. We assume a general class of gauge models and the parton model, but no details of the parton distributions. The result is useful for examining the structure of right-handed particle multiplets.

45604 Determination of the sea-quark distributions in the proton by single-particle inclusive reactions. Duke, D.W.; Taylor, F.E. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Phys. Rev., D;* **17**: No. 7, 1788-1794(1 Apr 1978).

We have determined the sea-quark distributions of the proton by using recent data on meson production in the proton fragmentation region in high-energy proton-proton collisions. We find that the magnitude of the sea distributions in hadron reactions is larger than the sea measured in lepton experiments. We interpret this enhancement as due to the additional contribution of quark-antiquark pairs created in the initial hadron collision. From our determination of the sea-quark distributions we are able to predict a number of particle ratios in single-particle inclusive production in p-p collisions. In addition, we have calculated the production cross section for low-mass muon pairs by the Drell-Yan mechanism and have obtained good agreement with experiment.

45605 Gauge models of the VV + AA type and their effective neutrino interactions. Ma, E.; Pakvasa, S. (Department of Physics and Astronomy, University of Hawaii at Manoa, Honolulu, Hawaii 96822). *Phys. Rev., D;* **17**: No. 7, 1881-1888(1 Apr 1978).

We display, and compare with neutrino data, all possible gauge models with exactly two diagonal Z bosons, such that the neutral-current interaction of the usual quarks and leptons is of the form VV + AA, thereby conserving parity in atomic physics. Only three solutions are found to be consistent with data. One is the "left-right" or "ambidexterous" SU(2)/sub L/ x SU(2)/sub R/ x U(1) model which reduces to the standard SU(2) x U(1) model; the other two are based on SU(3) x U(1) and one of them reduces to an SU(2) x U(1) model with a (u,b)/sub R/ doublet. These latter solutions are only obtainable by abandoning the usual quark-lepton symmetry that was assumed by one of us in an earlier paper.

45606 Production of four pions in e^+e^- collisions and partial conservation of axial current. Eidelman, S.I. (Nuclear Physics Institute, Siberian Division, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 417-419(5 Oct 1977).

It is shown that allowance for partial conservation of the axial current (PCAC) and for the identity of the final pions in the reaction e^+e^-→rho$\pi^+\pi^-$ leads to a total cross section energy dependence that agrees with experiment. The ratio of the cross sections of the reactions e^+e^-→rho$\pi^+\pi^-$ and e^+e^-→rho$\pi^0\pi^0$ is calculated.

45607 Multiple analysis of single-pion photoproduction in the region of the P_33 resonance. Miroshnichenko, I.I.; Nikiforov, V.I.; Sanin, V.M.; Sorokin, P.V.; Shalatskii, S.V. (Kharkov Physico—technical Institute, Ukrainian Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 52-57(Jul 1977).

This work investigates ambiguities in multipole-analysis solutions for pion photoproduction, elaborates methods for constructing energy dependences of the solutions obtained and investigates the sensitivity of amplitude calculations to the experimental material and to model postulates. Based on a proposed new procedure, the multipole analysis of the processes γp→pπ^0, γp→nπ^+, and γn→pπ^- is carried out at energies up to 500 MeV, and the calculated amplitudes are compared with theoretical predictions. The phase of the resonant amplitude M/sup 3/2//sub H/ is determined and is compared with the corresponding πN scattering phase shift. An upper limit is estimated for possible violation of T-invariance in the electromagnetic interactions.

45608 Determination of the electromagnetic radii of the nucleon. Kravtsov, A.V.; Nemenov, L.L. (Leningrad Institute of Nuclear Physics, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 75-76(Jul 1977).

The method of optimal conformal mapping is used to calculate the electromagnetic radii of the nucleon on the basis of data which do not make use of the scaling relation G/sub E/p=G/sub M/p/μ/sub p/. The parameters of the approximating functions are determined using not only the static values of the form factors, but also rigorous constraints on the derivatives of the spectral functions. The resulting values of the radii are r/sub E/p=0.817 +- 0.008 F, r/sub M/p=0.83 +- 0.02 F, and r/sub M/n=0.83 +- 0.03 F.

45609 Inclusive annihilation of a polarized e^+e^- pair with two detected hadrons. Khachatryan, G.N.; Shakhnazaryan, Y.G. (Yerevan Physics Institute). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 651-657(Jun 1977).

The inclusive annihilation of a polarized e^+e^- pair with two detected hadrons in the final state ($e^+e^- \rightarrow h_1h_2X$) is considered for the general case. The annihilation cross section is expressed in terms of five structure functions which describe the transition $\gamma^* \rightarrow h_1h_2X$. In addition, the partial widths of the corresponding decay of the virtual photon are introduced for various photon polarizations and the annihilation cross section is expressed in terms of these widths. Angular correlations of the detected hadrons are analyzed in terms of the structure functions and the partial widths. It is shown that the most information can be obtained by studying the azimuthal angular dependence in the annihilation of a longitudinally polarized e^+e^- pair. The density matrix of the virtual photon and its polarization multipole moments are also given.

45610 Bremsstrahlung in collisions of electrons in a magnetic field. Katkov, V.M.; Strakhovenko, V.M. (Institute of Nuclear Physics, Siberian Division, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 660-665(Jun 1977).

The influence of a magnetic field on bremsstrahlung is studied for collisions of high-energy electrons (positrons). The spectrum of bremsstrahlung photons is calculated; it can change considerably under the influence of a magnetic field.

WEAK INTERACTIONS

REFER ALSO TO CITATION(S) 45605

45611 Structure functions and charge ratios in muon-nucleon scattering. del Papa, C.; Dorfan, D.; Flatte, S.M.; Heusch, C.A.; Lieberman, B.; Meyer, H.; Moss, L.; Schalk, T.; Seiden, A.; Bunnell, K.; Duong-van, M.; Mozley, R.; Odian, A.; Villa, F.; Wang, L.C. (University of California, Santa Cruz, California). *Phys. Rev., D;* **17**: No. 11, 2843-2846(1 Jun 1978).

We present the fractional energy distributions for positive and negative hadrons produced in muon-proton and muon-neutron scattering, and ensuing charge ratios for the photon fragmentation region. Data presented for a center-of-mass energy range $2.8 < W < 4.5$ GeV and a virtual-photon mass-squared range $0.5 < \text{or} = Q^2 < \text{or} = 4.5$ GeV^2 indicate an overall equality of summed structure functions for neutron and proton targets, which exhibit approximate independence of Q^2 and ω'. Implications in terms of quark-fragmentation ideas are discussed.

45612 Hadronic polarization in neutrino scattering. Donoghue, J.F. (Department of Physics, Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213). *Phys. Rev., D;* **17**: No. 11, 2922-2926(1 Jun 1978).

Using a parton-model framework we show how the polarization of unstable hadrons produced in neutrino scattering may be used to study the helicity structure of the weak neutral current. Consistency tests of the framework are also suggested.

45613 Kaon-electron correlations in the semileptonic decays of D mesons. Wilson, W.J. (University of Minnesota, School of Physics and Astronomy, Minneapolis, Minnesota 55455). *Phys. Rev., D;* **17**: No. 11, 3032-3037(1 Jun 1978).

In this paper the reaction $e^+e^- \rightarrow e^{+-}K^{-+}$ + anything is analyzed, under the assumption the electron and kaon are products of the semileptonic decay of a D meson. If it is assumed that the principal decay mode is $D \rightarrow K^*ev$ then it is shown that the average values of the electron energy, the kaon energy, and the K-e invariant-mass squared must, quite generally, lie within a small two-dimensional region. On the other hand, if it is assumed that the dominant decay mode is $D \rightarrow Kev$ then the three averages must lie on a straight line which does not intersect the K^* plane. Using these results one can experimentally test in a completely model-independent way the notion that these two modes saturate the decay rate. One is also able to measure the relative branching ratios of these two modes without making any specialized assumptions.

45614 Parity violation in atoms induced by radiative corrections. Marciano, W.J.; Sanda, A.I. (Department of Physics, The Rockefeller University, New York, New York 10021). *Phys. Rev., D;* **17**: No. 11, 3055-3064(1 Jun 1978).

We discuss the radiative corrections that induce a parity-violating electron-nucleus interaction in gauge theories. These higher-order effects are shown to be much larger than one might anticipate in a wide class of models. In particular, for an SU(2) x U(1) gauge model in which the electrons's neutral-current coupling is pure vector, they lead to an optical rotation in bismuth which is about 11% as large as that predicted by the standard Weinberg-Salam model and opposite in sign: an experimentally testable consequence. Similar results are also found for an SU/sub L/(2) x SU/sub R/(2) x U(1) model in which parity-violating neutral currents are naturally absent in lowest order. General formulas for the dominant radiative corrections which are applicable to most models are presented. The relevance of our results for experiments and ordinary hydrogen and deuterium is also discussed.

45615 Origin of muon-induced dimuons and scale violation at small x. Chen, K.W.; Van Ginneken, A. (Michigan State University, East Lansing, Michigan 48823). *Phys. Rev. Lett.;* **40**: No. 22, 1417-1420(29 May 1978).

It is argued that if multimuon events observed in deep-inelastic muon scattering are manifestations of associated charmed-meson production, then the latter may be responsible for a sizable fraction of observed scaling violations at small values of the scaling variable x.

45616 Determination of the weak neutral-current couplings. Abbott, L.F.; Barnett, R.M. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev. Lett.;* **40**: No. 20, 1303-1306(15 May 1978).

A model-independent analysis of new data provides, for the first time, a unique determination of the weak neutral-current couplings, of u and d quarks. Data for exclusive pion production are a crucial new input in this analysis.

45617 Origins of neutrino events with three muons. Barnett, R.M.; Chang, L.N.; Weiss, N. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev., D;* **17**: No. 9, 2266-2275(1 May 1978).

The experimental observation of events in neutrino scattering with three outgoing muons presents a potential challenge to SU_2 x U_1 gauge models, depending on the source of such events. In this paper a comprehensive study is reported of four possible modes of trimuon production (hadronic, mixed, leptonic, and trident modes). Background sources are expected to be significant and will have to be separated from other sources. Attention is also given to two trimuon events with extraordinarily energetic muons.

45618 Neutrino oscillations in matter. Wolfenstein, L. (Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213). *Phys. Rev., D;* **17**: No. 9, 2369-2374(1 May 1978).

The effect of coherent forward scattering must be taken into account when considering the oscillations of neutrinos traveling through matter. In particular, for the case of massless neutrinos for which vacuum oscillations cannot occur, oscillations can occur in matter if the neutral current has an off-diagonal piece connecting different neutrino types. Applications discussed are solar neutrinos and a proposed experiment involving transmission of neutrinos through 1 000 km of rock.

45619 Weak-interaction-induced neutrino oscillations. Cheng, T.P.; Li, L. (Joseph Henry Laboratories, Princeton University and Institute for Advanced Study, Princeton, New Jersey 08540). *Phys. Rev., D;* **17**: No. 9, 2375-2382(1 May 1978).

Neutrino oscillation is a natural theoretical possibility in gauge theories if we do not a prori exclude the right-hand components of neutrino fields. The quantitative aspects of the oscillation phenomenon (oscillation length, etc.) are controlled by the neutrino mass matrix. We explore the possibility that neutrinos are massless in the lowest order of weak interactions and higher-order radiative corrections bring about small, but calculable, masses. We have made a systematic search of models which would have such a feature. We find that in one class of models, the neutrino-mass matrix elements would generally be less than 10^-2 eV. But such theories would contain flavor-changing neutral currents involving charged lepton fields. Another class of models, which can easily be compatible with all known weak-interaction phenomenology, would necessarily involve large gauge groups (e.g., direct products of at least three non-Abelian factors) and a large number of unknown parameters (making it impossible to meaningfully estimate the neutrino masses).

45620 Implications of the Y (9.5) for gauge theories of weak interactions. Albright, C.H.; Shrock, R.E.; Smith, J. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Phys. Rev., D;* **17**: No. 9, 2383-2409(1 May 1978).

We analyze the implications of the discovery of the Y (9.5), assumed to be a heavy-quark-antiquark bound state, for gauge theories of weak interactions and especially for neutrino reactions. Taking into account all present experimental constraints, we study the consequences of particular multiplet assignments of the new heavy quark in models based on the group SU(2) x U(1) and higher gauge groups, in particular SU(3) x U(1). In neutrino and antineutrino reactions in which this new quark is produced, its semileptonic decays will provide a key signal for its discovery. We specialize to the SU(3) x U(1) model and give a careful analysis of multimuon events arising from the production of this heavy quark and the concomitant heavy lepton.

45621 Is the tau a paraelectron. Rosen, S.P. (Purdue University, West Lafayette, Indiana 47907). *Phys. Rev. Lett.;* **40**: No. 16, 1057-1060(17 Apr 1978).

I show that the equality of the rate for tau $\rightarrow \mu^+ +$ neutrinos and tau$^+ \rightarrow \epsilon^+ +$ neutrinos does not necessarily exclude the possibilty that tau$^+$ is a paraelectron with the same lepton number as e^-, but it does require some rather unconventional decay matrix element. Different matrix element predict different values for Michel rho parameters and daughter lepton helicities; test for the paraelectron assignment occur in $\epsilon^+ \epsilon^-$ annihilation.

45622 Lepton mixing and neutrino oscillations. Bilen'kii, S.M.; Pontecorvo, B.M. (Joint Institute for Nuclear Research). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 10, 776-795(Oct 1977).

The phenomenon of neutrino oscillations is reviewed. The case of mixing of two neutrinos (both Majorana and Dirac neutrinos) of masses m_1 and m_2 is considered in detail. It is shown that the mixing hypothesis is consistent with the existing data if vertical-barm$^2_1$—m$^2_2$vertical-bar< or ≈ 1 eV^2 (for maximal mixing). A discussion is given of possible experiments to search for oscillations of neutrinos from reactors, meson factories, and high-energy accelerators. Oscillations can be observed in these experiments if vertical-barm$^2_1$-m$^2_2$vertical-bar> or $\approx 10^{-2}$ eV^2. The prospects of searches for neutrino oscillations in experiments using cosmic neutrinos, and in particular solar neutrinos, are discussed in detail. Such experiments have a unique sensitivity as tests of the mixing hypothesis (in the case of solar neutrinos, mixing effects would be observed if vertical-barm$^2_1$-m$^2_2$vertical-bar> or $\approx 10^{-12}$ eV^2). The "solar neutrino paradox" is discussed in detail from the point of view of neutrino mixing. Neutrino oscillations are also considered in the case when there exist in nature N>2 types of neutrinos. Schemes involving the mixing of heavy leptons are discussed. It is shown in the framework of a specific scheme involving right-handed currents that for heavy-lepton masses of the order of several GeV the probabilities of processes such as $\mu \rightarrow e\gamma$ and $\mu \rightarrow 3e$ can be close to the existing experimental upper limits. The probabilities of these processes are practically zero when only the neutrinos are mixed.

45623 Possible existence of a weak V+A lepton-lepton interaction. Volkov, G.G.; Nikitin, Y.P.; Sokolov, A.A. (Institute of High Energy Physics, Serpukhov). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 77-79(Jul 1977).

The possible existence of a weak V+A lepton-lepton interaction is discussed. The feasibility of detecting it experimentally is considered.

45624 Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces. Strikman, M.I.; Frankfurt, L.L. (Leningrad Institute of Nuclear Physics, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 625-629(Jun 1977).

It is shown that the hypothesis of vector dominance is qualitatively inapplicable to deep inelastic processes. It is shown how measurement of the cross section for semi-inclusive e (νnu-bar) scattering on deuterons and on nuclei allows one to study experimentally the agreement between the quark-parton and meson hypotheses concerning the nature of nuclear forces and also to obtain quantitative information about short range correlations in the nucleus. An estimate of the position of the nuclear core is given within the framework of the quark model.

45625 Possible test of the PCAC hypothesis in neutrino reactions. Folomeshkin, V.N. (Institute of High Energy Physics, Serpukhov). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 647-648(Jun 1977).

The possibility of testing the PCAC hypothesis in neutrino-nucleon reactions at small vertical-barq^{2}vertical-bar with allowance for background terms is considered. A direct test of the PCAC hypothesis is possible only within a very narrow range of values vertical-barq^{2}vertical-bar<5m^2/sub π/.

STRONG INTERACTIONS, GENERAL

45626 Gluon contribution to hadronic J/psi production. Glueck, M.; Owens, J.F.; Reya, E. (Institut fuer Physik, Universitaet Mainz, 6500 Mainz, West Germany). *Phys. Rev., D;* **17**: No. 9, 2324-2331(1 May 1978).

Using the recent CERN and Fermilab measurements for J/psi production by π^{+-}, K^{+-}, p, and p-bar beams we show, within the framework of quantum chromodynamics, that only a combined version of light-quark qq-bar $\rightarrow$ cc-bar fusion and gluon gg $\rightarrow$ cc-bar fusion mechanisms can account for the various total-cross-section beam ratios as well as for the observed x/sub F/ distributions.

45627 Radial excitations of hadronic bags. DeGrand, T.; Rebbi, C. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev., D;* **17**: No. 9, 2358-2363(1 May 1978).

We investigate the spectrum of radial excitations of the bag model. Breathing excitations of the surface of the bag couple to the radially excited states of quarks in the bag, resulting in a spectrum of states which interpolates between the energy levels of the fixed-cavity approximation. We discuss this effect in detail for a bag containing bosons. We apply our results to fermionic systems and find that the radial excitations of baryons contain an NP11(1410) Roper-resonance candidate as a natural consequence of the effects of breathing modes.

45628 Classical space-time concepts in high-energy collisions. Low, F.E.; Gottfried, K. (Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev., D;* **17**: No. 9, 2487-2491(1 May 1978).

We show that the observed rapidity dependence of production amplitudes implies a simple classical picture of the longitudinal evolution of the collision.

45629 Quantum-chromodynamic spin-spin asymmetries in large-P/sub T/ hadron production with polarized beam and target. Babcock, J.; Monsay, E.; Sivers, D. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev. Lett.;* **40**: No. 18, 1161-1163(1 May 1978).

We calculate in quantum-chromodynamic perturbation theory the spin-spin asymmetrics for the fundamental 2 $\rightarrow$ 2 scattering processes involving quarks and gluons. Using simple, reasonable assumptions concerning the distribution functions for definite-helicity quarks and gluons in a spinning proton we find that the idea that large-p/sub T/ events arise from the hard scattering of quarks and gluons leads to a measurable asymmetry for inclusive hadron production at large P/sub T/ from a polarized beam and target.

45630 Corrections to the solution of the unitarity relation. Arushanov, G.G.; Yulchiev, A. (Physico-technical Institute, Uzbek Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 98-101(Jul 1977).

The first and second order corrections in powers of k$^-$2 are found for the solution of the unitarity relation for the hadron elastic-scattering amplitude at high energies. It is shown that these corrections may dominate at large momentum transfers and for t=0 the correction $\sim$k$^-$2 qualitatively leads to the same effect as allowance for the real part of the amplitude.

STRONG INTERACTIONS, BARYON NO.=0

45631 Adler zero and the dual multiperipheral model. Balazs, L.A.P. (Physics Department, Purdue University, West Lafayette, Indiana 47907). *Phys. Rev., D;* **17**: No. 11, 3124-3126(1 Jun 1978).

We show that the $\pi\pi \rightarrow \pi\pi$ Adler PCAC (partial conservation of axial-vector current) condition requires a Reggeon intercept α (0) $\cong$ 0.5 within a broad class of multiperipheral models at the planar and cylinder levels. In the planar approximation this is closely related to the cancellation of the Reggeon-Reggeon cut.

45632 Strong tensor forces and the possibility of high-spin states in the nucleon-antinucleon system. Dover, C.B.; Richard, J.M. (Brookhaven National Laboratory, Upton, N. Y. 11973). *Phys. Rev., D;* **17**: No. 7, 1770-1777(1 Apr 1978).

The antinucleon-nucleon (N-barN) potential, in isospin I = 0 states, contains a strong tensor component which is a coherent sum of contributions from different meson exchanges. The large mixing of L = J - 1 and L = J + 1 orbital momenta induced by the tensor potential can produce I = 0 high-spin states (3^-,4^+,5^-) relatively near to the N-barN threshold.

45633 Resonance-particle interaction amplitudes for arbitrary spins. Polikarpov, M.I. (Institute of Theoretical and Experimental Physics, State Atomic Energy Commission). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 82-86(Jul 1977).

The three-particle unitarity relation (UR) is used to derive a UR for the amplitude describing the scattering of a two-particle resonance by a particle in the case of arbitrary spins. The resulting equations differ from the usual URs for the scattering amplitudes of stable particles by the presence of a crossed term. The final expressions for the unitary discontinuities are written in the JLS-representation. The three-pion system is considered in an appendix, where a calculation is made of the quantities which appear in the URs for the amplitudes describing the interaction of ϵ, rho, and f resonances with a pion.

STRONG INTERACTIONS, BARYON NO.=1

45634 K-matrix fits to πN $\rightarrow$ Nπ and πN $\rightarrow$ N$\pi\pi$ in the resonance region $\sqrt{s}$ = 1.3 to 2.0 GeV. Longacre, R.S.; Lasinski, T.; Rosenfeld, A.H.; Smadja, G.; Cashmore, R.J.; Leith, D.W.G.S. (Department of Physics and Lawrence Berkeley Laboratory, Uni-

versity of California, Berkeley, California 94720). *Phys. Rev., D;* **17**: No. 7, 1795-1825(1 Apr 1978).

Starting with partial-wave amplitudes for $\pi N \rightarrow N\pi$ and $\pi N \rightarrow$ several isobar-model states of $N\pi\pi$, we are able to apply the constraint of unitarity (using the K matrix). This permits the removal of the overall phase ambiguity of the isobar amplitudes at each energy. The K-matrix fits generate a smooth prescription for the T-matrix amplitudes, enabling us to search the complex energy plane for poles. The uniqueness of these poles is demonstrated by doing Breit-Wigner refits to the fitted T-matrix amplitudes. The success of the refits and the obvious interpretation justifies a simple determination of coupling signs for which there can be checks with theory.

45635 Description of the energy dependence of inclusive cross sections in the double-Reggeon representation. Likhoded, A.K.; Tolstenkov, A.N.; Shlyapnikov, P.V. (Institute of High Energy Physics, Serpukhov). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 79-82(Jul 1977).

New experimental data on the yields of pions and kaons in the central region of inclusive spectra are analyzed in terms of the double-Reggeon mechanism. It is shown that the strong growth of the inclusive cross section which is observed in the ISR energy region is reproduced in a natural way by this mechanism if allowance is made for a Reggeon-Reggeon term. A simultaneous fit to all the experimental data, including those at low energy, can be obtained in this way. The value obtained for the height of the asymptotic "plateau" is found to be greater in fits without Reggeon-Reggeon terms. It is predicted that "early" scaling is violated at high energies in reactions in which it was previously found to hold ($\pi^- p \rightarrow \pi^-$, $K^+ p \rightarrow K^0$, etc.).

STRONG INTERACTIONS, BARYON NO. GREATER THAN 1

45636 Implications of nucleon-nucleon spin-polarization measurements. Berger, E.L.; Irving, A.C.; Sorensen, C. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., D;* **17**: No. 11, 2971-2991(1 Jun 1978).

We discuss available data for spin observables in pp and np elastic scattering above 3 Gev/c. We identify those measurements which isolate exchange amplitude components of specific interest: those which provide firm tests of Regge-exchange models and, on the other hand, those which models are unable to predict reliably. Using a simple Regge-pole-exchange model whose trajectory parameters and coupling properties are determined from data on other reactions, we compute expectations for all available pp spin observables and find good agreement with the data. We find that a hadronic axial-vector A_1-like exchange term is present in the data with strength compatible with theoretical estimates. The low-lying isoscalar excahnge observed in pp and np polarization is consistent with estimates based on ϵ (9^{++}) exchange. We make a careful study of possible nonasymptotic Regge contributions which could obscure the interpretation of amplitude structure at momenta up to 6 GeV/c. We provide predictions for spin-correlation observables in np elastic and in np charge-exchange scattering.

45637 Inclusive pion production in relativistic proton collisions with nuclei, a reexamination. Landau, R.H. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 6, 2144-2150(Jun 1978).

Various data for the $pA \rightarrow \pi^{+-} X$ reaction are examined with emphasis on viewing these data in a light most useful for understanding π production in heavy ion collisions. The 730 MeV (proton energy) results of Cochrane et al. are found to display a large amount of scaling: if plotted as a function of the Feynman variable x/sub R/ and if the k/sub perpendicular/ behavior is removed. Viewed in this matter, the larger x/sub R/ behavior of the 730 MeV data agree well with the 1—5 GeV data of Papp et al. In the forward hemisphere, π production from nuclei appears simply related to nucleon-nucleon π production and is consistent with the limiting behavior of hard collision models. In the backward hemisphere, there is evidence for nuclear structure effects and clustering phenomena not included in hard collision models.

45638 Can the Fermi motion of partons recover canonical scaling in hadronic high-p/sub T/ processes. Halzen, F.; Ringland, G.A.; Roberts, R.G. (Physics Department, University of Wisconsin, Madison, Wisconsin 53706). *Phys. Rev. Lett.;* **40**: No. 15, 991-994(10 Apr 1978).

We study the effects on high-p/sub T/ spectra of hadrons when partons are allowed to have transverse momentum (Fermi motion). We find the following: (i) The importance of Fermi motion depends crucially on the treatment of "soft" parton-parton collisions. (ii) We disagree with recent claims that values of $< k/\text{sub } T/ > \simeq$ 0.6 GeV/c allow canonically scaling quark-quark scattering to describe the data. (iii) We show, furthermore, that even larger values of $< k/\text{sub } T/ >$, however implausible, cannot reconcile canonical scaling with the present data.

45639 Can existing high—transverse-momentum hadron experiments be interpreted by contemporary quantum chromodynamics ideas. Field, R.D. (California Institute of Technology, Pasadena, California 91125). *Phys. Rev. Lett.;* **40**: No. 15, 997-1000(10 Apr 1978).

It is shown that if in a calculation of high—transverse-momentum mesons production in hadron-hadron collisions one includes not only the scale-breaking effects that might be expected from asymptotically free theories but also the effects due to the transverse momentum of quarks in hadrons,then the results are not inconsistent with the single-particle cross-section data.

45640 Possible existence of a second minimum in elastic pp scattering. Chou, T.T.; Chen Ning Yang. (Department of Physics, University of Georgia, Athens, Georgia 30602). *Phys. Rev., D;* **17**: No. 7, 1889-1890(1 Apr 1978).

Comparing new elastic pp data at 200 and 1500 GeV, it is suggested that at higher energies $d\sigma/dt$ "caves in" at an intermediate t value. Comparison with predictions of a geometrical picture leads to the speculation of the existence of a second minimum and a third maximum in the elastic differential cross section.

45641 High energy (E < or = 1000 GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data. Bertini, H.W.; Culkowski, A.H.; Hermann, O.W.; Gove, N.B.; Guthrie, M.P. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev., C;* **17**: No. 4, 1382-1394(Apr 1978).

An intranuclear cascade model for reactions of pions and nucleons with complex nuclei that should cover the energy range from about 50 MeV to about 1000 GeV has been developed. The model includes the effect of a diffuse nuclear surface, the Fermi motion of the bound nucleons within the nucleus, the exclusion principle, a local potential for nucleons, a localized reduction in the density of the nucleus during the development of the cascade, and the sequencing of the events correctly with time. Theoretical results from the model are compared with experimental data over the energy range ~ 3—1000 GeV. Within the cascade model, the equations that are used to represent the pion multiplicity from the reactions of nucleons and pions with the individual nucleons of the nucleus underestimates the number of shower particles produced by these individual nucleon interactions. In spite of this the predicted number of shower particles escaping from the nucleus, for 100-GeV nuclear interactions, is overestimated by about 25% for light nuclei to about 60% for heavy nuclei. The agreement for the number of escapes from the nucleus is somewhat better at lower interaction energies (~ 10—20 GeV). Some of the major trends in the observed high energy data are predicted quite well. These include the energy independence of (a) the number of black tracks produced at interaction energies above 5 GeV, (b) the number of shower particles produced above 100 GeV, and (c) the radionuclides produced above 10 GeV. Other trends that are predicted fairly well are the small mass dependence of the shower particle multiplicity (factor of 2 increase predicted from carbon to lead; factor of 1.5 measured), and the change in the angular dependence of the multiplicity with mass. In absolute comparisons, the predicted total reaction cross sections are in good agreement with experimental data, and the cross sections for the production of radionuclides are in fair agreement.

45642 Production of relativistic particles on nuclei at large angles and the role of multiple processes. Kopeliovich, V.B. (Institute for Nuclear Research, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 87-94(Jul 1977).

A mechanism is considered for the production of fast particles on nuclei at large angles in the region which is kinematically forbidden for interaction with an individual nucleon; the mechanism is the successive rescattering of particles by the nucleons of the nucleus. A method is presented for calculating the probability of such processes; it is based on the small size of the phase volume and takes into account the Fermi motion of nucleons inside the nucleus. The calculations carried out for proton production are found to be in qualitative agreement with experiment and are consistent with it quantitatively. The production of resonances in the intermediate state is most significant when the emission angle of the particle is $\Theta \sim \pi$ and the momentum $k \sim 1$ GeV/c. The presence of recoil nucleons and the polarization of the final protons are characteristic of the multiple interaction mechanism.

45643 Associative multiplicity in scattering by a deuteron with large momentum transfer. Dokshitser, Y.L.; Ryskin, M.G. (Leningrad Institute of Nuclear Physics). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 670-676(Jun 1977).

It is shown that inelastic rescatterings predominate in pd interactions with large momentum transfers. This causes a substantial growth of the associative multiplicity in the reaction $pd \rightarrow d+X$. Measurement of the multiplicity in the proton-dissociation region makes it possible to ascertain whether sticking together of the parton ladders emitted by the different nucleons of the nucleus takes place,

a phenomenon that leads in the academic asymptotic approach to equality of all the cross sections.

45644 Contribution of inelastic rescattering to cumulative meson production. Braun, M.A.; Vechernin, V.V. (Leningrad State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 676-682(Jun 1977).

It is shown that the formation of large masses in the intermediate state in inelastic rescattering by deuteron nucleons leads to production of cumulative pions in the entire kinematically accessible region, particularly in the backward direction in the deuteron rest system. The contribution of the resonance and of multiparticle intermediate states to this process is estimated. It is shown that in contrast to the contribution of the resonance, the contribution of the multiparticle intermediate states is of the order of the experimental data. Since the principal contribution at high cumulativity is made by diagrams of the three-Reggeon type, in which pairs of Δ or N Reggons branch away to the deuteron, the dependence of the cumulative cross section on the Feynman variable x near x=1 takes the form (1-x)/sup 2.4/.

45645 Unitarity condition and large-angle elastic scattering. Pirmatov, I.I. (S. V. Starodubtsev Physico-Technical Institute, Uzbek Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 682-685(Jun 1977).

Large-angle elastic scattering is studied on the basis of the unitarity condition. It is shown that the unitarity condition and the experimentally known form of the diffraction peak make it possible to account for the angular distribution of pp scattering over the entire range of momentum transfers.

PARTICLE INVARIANCE PRINCIPLES AND SYMMETRIES

GENERAL

45646 Spontaneous symmetry breaking and nonlinear invariant Lagrangians: Applications to SU(2) x U(1) and OSp(1/4). Guersey, F.; Marchildon, L. (Physics Department, Yale University, New Haven, Connecticut 06520). *Phys. Rev., D;* **17**: No. 8, 2038-2047(15 Apr 1978).

The formalisms of spontaneous symmetry breaking and of the theory of nonlinear Lagrangians are reviewed, with emphasis on the relationships between the two. The former is applied to the Weinberg-Salam model, in which case the physical fields and their explicit transformation laws under finite group action are exhibited. The latter is illustrated through the example of the graded Lie group OSp(1/4). Locally covariant fields and derivatives are then constructed, and invariant terms are written down which contain the Lagrangian of supergravity.

APPLICATIONS TO ELECTROMAGNETIC AND WEAK INTERACTIONS

REFER ALSO TO CITATION(S) 45614

45647 Generalization of the electromagnetic current operator. Bohm, A. (Center for Particle Theory, Physics Department, University of Texas at Austin, Austin, Texas 78712). *Phys. Rev., D;* **17**: No. 11, 3127-3129(1 Jun 1978).

The present experimental data for the radiative decays of vector mesons require a generalization of the Gell-Mann—Nishijima formula for the electromagnetic current. This generalization will affect the values of the magnetic moments but not the charges.

45648 Neutral-current constraints on SU(2) x U(1) gauge theories. Mathur, V.S.; Rizzo, T. (Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627). *Phys. Rev., D;* **17**: No. 9, 2449-2461(1 May 1978).

In this paper we formulate a set of empirical rules for constructing SU(2) x U(1) gauge models by considering the constraints imposed by the present neutral-current data. To do this we allow, apart from the constraints imposed by universality and quark-lepton symmetry, arbitrary left- and right-handed fermion multiplet structures as well as an arbitrary Higgs sector. Before doing the general analysis we consider two examples where there are additional simplifying results. Some simple models satisfying the empirical rules are also discussed.

45649 Symmetry breaking and naturalness of parity conservation in weak neutral currents in left-right—symmetric gauge theories. Mohapatra, R.N.; Paige, F.E.; Sidhu, D.P. (Brookhaven National Laboratory, Upton, N.Y., 11973). *Phys. Rev., D;* **17**: No. 9, 2462-2470(1 May 1978).

We discuss the symmetry-breaking patterns and the naturalness of parity conservation in weak neutral-current interactions in the left-right—symmetric SU(2)/sub L/ x SU(2)/sub R/ x U(1) gauge theories. Two Higgs systems are discussed which enable us to achieve the desired breaking of the gauge symmetry. We show by a detailed analysis of the Higgs potential that the more economical of the two Higgs systems, that involving left and right Higgs scalar doublets, fails to meet the criteria of naturalness of parity conservation in neutral-current interactions. We find that with the second Higgs system neutral currents conserve parity naturally regardless of the structure of the physical charged-current weak interactions. Implications of this for the computability of induced parity violation in higher orders and the search for parity nonconservation in atoms are also discussed.

45650 CP violation in left-right—symmetric gauge theories and possible existence of absolutely stable hadrons. Mohapatra, R.N.; Sidhu, D.P. (Department of Physics, The City College, The City University of New York, New York, N.Y. 10031). *Phys. Rev., D;* **17**: No. 7, 1876-1880(1 Apr 1978).

The question of independent CP-violating phases is analyzed within the framework of left-right—symmetric SU(2)/sub R/ x SU(2)/sub R/ x U(1) gauge theories. Constraints on the cP-violating phases resulting from particular choices of symmetry breaking are discussed. Their implications for the CP-violation model suggested earlier by Mohapatra and Pati are noted. It is pointed out that in models with more than four quarks, the relation between the magnitudes of the CP-violating parameter eta/sub +/- and parity-violation parameter (M/sub W/ +- L/M/sub W/ +- R)^2 noted in the above paper can be maintained provided there is no mixing between heavier and lighter quarks. This leads to an island of stable and quasistable high-mass hadrons.

APPLICATIONS TO STRONG INTERACTIONS

45651 Forbidden decays psi′ → eta + psi and psi′ → π^0 + psi. Bhandari, R.; Wolfenstein, L. (Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213). *Phys. Rev., D;* **17**: No. 7, 1852-1853(1 Apr 1978).

It is proposed that the SU(3) violation in the decay psi′ → eta + psi arises from the proximity of the D-barD threshold to the psi′ mass in contrast to the F-barF threshold. In this case the D^+-D^0 mass splitting leads to the SU(2) -violating decay psi′ → π^0 + psi, which is calculated to have a rate not far below its present experimental limit.

45652 Spontaneous breaking of scale invariance in gauge theories. Iofa, M.Z. (P. N. Lebedev Physics Institute, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 102-107(Jul 1977).

A mechanism for the generation of fermion (quark) mass by a spontaneous breaking of scale invariance is considered in the framework of a nonabelian gauge theory. The scale Ward identities are postulated to have the same form in the nonsymmetric theory as in the symmetric one; however a pole at $q^2=0$ arises in the vertex function Γ/sup D//sub lambda/(q;p,p+q) of the scale transformation current as a result of the spontaneous symmetry breaking. The residue of this pole at q=0 is identified with the mass derivative of the fermion propagator m (partial/partialm) $S^{-1}(p)$. An equation for the propagator S (p) is obtained from the Dyson equation for Γ/sup D//sub lambda/ and the scale Ward identity. In an asymptotically free theory the effective coupling constant satisfies g (κ) →0 as κ→∞ and it is hence sufficient to use the lowest $g^2(\kappa)$ approximation for the kernel of the equation when investigating the asymptotics of the solution. Two solutions are shown to exist in the considered approximation, one coinciding with the asymptotics of the massive theory, the other corresponding to the appearance of a Goldstone excitation, related to the symmetry breaking.

FIELD THEORY

REFER ALSO TO CITATION(S) 45789

45653 Nonlinear gauge fields and the structure of gravity and supergravity theories. Chang, L.N.; Mansouri, F. (Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania 19174). *Phys. Rev., D;* **17**: No. 12, 3168-3178(15 Jun 1978).

By regarding the gauge fields which arise in theories based on nonlinear realizations of gauge symmetries as dynamical variables, we show that gravity, with or without matter, supergravity, and extended supergravity theories possess such symmetries. The model-independent transformation laws for such fields remain unaltered when extended supergravity theories are considered. For groups such as OSp(N;4), the supersymmetry part of the group must be realized nonlinearly. It is pointed out that in this scheme to realize supersymmetry transformations linearly, one possibility is to consider the inhomogeneous extensions of the supergroups OSp(N;2C), i.e., IOSp(N;2C). We also consider the consequences of this point of

view in regard to flat-space-time gauge theories and show that instead of the usual set of Yang-Mills equations supplemented with gauge conditions which break the gauge covariance completely, it is possible to formulate a system of equations which are equal in number to the above set but which maintain gauge covariance with respect to the unbroken part of the gauge symmetry.

45654 Disconnected gauge groups and the global violation of charge conservation. Kiskis, J. (Institute for Advanced Study, Princeton, New Jersey 08540). *Phys. Rev., D;* **17**: No. 12, 3196-3202(15 Jun 1978).

We show that a gauge group is naturally enlarged to include certain discrete internal symmetries such as charge conjugation. The full gauge group is then disconnected. If space-time is not simply connected, then a mechanism for the global violation of charge conservation results. Examples are given in space dimensions one through three. Gauge theories based on non-Abelian simple compact Lie algebras are also discussed.

45655 Field theory on a lattice: Absence of goldstone bosons in the U(1) model in two dimensions. Drell, S.D.; Weinstein, M. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev., D;* **17**: No. 12, 3203-3211(15 Jun 1978).

We study the U(1) -Goldstone model in two dimensions. We formulate this model on a one-dimensional spatial lattice and show that Coleman's theorem (i.e., there exist no Goldstone bosons in two dimensions) is satisfied by the solution found by the variational approach of dissecting the lattice into small (4-site) blocks and iteratively constructing an effective truncated Hamiltonian.

45656 Classical algebraic chromodynamics. Adler, S.L. (The Institute for Advanced Study, Princeton, New Jersey 08540). *Phys. Rev., D;* **17**: No. 12, 3212-3224(15 Jun 1978).

I develop an extension of the usual equations of SU(n) chromodynamics which permits the consistent introduction of classical, noncommuting quark source charges. The extension involves adding a singlet gluon, giving a U(n) -based theory with outer product P/sup a/(u,v) = (1/2)(d/sup a/bc + if/sup a/bc)(u/sup b/v/sup c/ - v/sup b/u/sup c/) which obeys the Jacobi identity, inner product S(u,v) = (1/2)(u/sup a/v/sup a/ + v/sup a/u/sup a/), and with the n^2 gluon fields elevated to algebraic fields over the quark color charge C* algebra. I show that provided the color charge algebra satisfies the condition S(P(u,v),w) = S(u,P(v,w)) for all elements u,v,w of the algebra, all the standard derivations of Lagrangian chromodynamics continue to hold in the algebraic chromodynamics case. I analyze in detail the color charge algebra in the two-particle (qq, qq-bar, q-barq-bar) case and show that the above consistency condition is satisfied for the following unique (and, interestingly, asymmetric) choice of quark and antiquark charges: Q/sup a//sub q/ = ξ/sup a/, Q/sup a//sub q/ = xi-bar/sup a/ + δ/sup a/0(n/2)/sup 3/2/1, with ξ/sup a/ξ/sup b/ = (1/2)(d/sup a/bc + if/sup a/bc) ξ/sup c/, xi-bar/sup a/xi-bar/sup b/ = -(1/2)(d/sup a/bc - if/sup a/bc) xi-bar/sup c/. The algebraic structure of the two-particle U(n) force problem, when expressed on an appropriately diagonalized basis, leads for all n to a classical dynamics problem involving an ordinary SU(2) Yang-Mills field with uniquely specified classical source charges which are nonparallel in the color-singlet state. An explicit calculation shows that local algebraic U(n) gauge transformations lead only to a rigid global rotation of axes in the overlying classical SU(2) problem, which implies that the relative orientations of the classical source charges have physical significance.

45657 Vacuum degeneracy and confinement in the massive Schwinger model. Pak, N.K. (Department of Physics, B-019, University of California, San Diego, La Jolla, California 92093). *Phys. Rev., D;* **17**: No. 12, 3262-3267(15 Jun 1978).

We show that a new class of Euclidean gauge field configurations carrying half a unit of topological charge are responsible for confining quarks in the massive Schwinger model, for all coupling strengths, when surface effects are properly taken into account. There is, however, evidence for a phase transition for certain values of the vacuum periodicity angle θ, depending on the charge of the quarks.

45658 Equivalence of worlds with different θ values in massless quantum chromodynamics. Stump, D.R. (Department of Physics and Astronomy, The University of Rochester, Rochester, New York 14627). *Phys. Rev., D;* **17**: No. 12, 3281-3283(15 Jun 1978).

It is proved in detail that non-Abelian gauge field theories with different values of the vacuum parameter θ are equivalent when the fermions are massless. A careful discussion of the zero modes is necessary for a complete proof.

45659 Effects of classical fields in meson correlations. Fowler, G.N.; Weiner, R.M. (Physics Department, University of Marburg, Germany). *Phys. Rev., D;* **17**: No. 11, 3118-3123(1 Jun 1978).

The existence of a classical (coherent) component in the mesonic field as suggested by recent developments in particle physics generates under certain conditions a statistical distribution corresponding to a mixture of chaotic and coherent fields. The methods of quantum optics are used to investigate the effects of this mixture in the correlations. The relevance of this to the Hanbury Brown and Twiss effect in particle physics is discussed. Preliminary comparison with the data suggests that an appreciable coherent component might be present.

45660 Screening solutions to classical yang-mills theory. Sikivie, P.; Weiss, N. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev. Lett.;* **40**: No. 22, 1411-1413(29 May 1978).

We present two new solutions to the classical Yang-Mills field equations in the presence of a localized external source. These solutions totally screen the charge of the source. They have lower energy than the corresponding Coulomb solution.

45661 Instantons and the hypothetical light boson. Baluni, V. (Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev. Lett.;* **40**: No. 21, 1358-1362(22 May 1978).

The mass formula for the π, eta, A (axion) system is analyzed taking into account explicit instanton effects. It is argued that small-size instantons serve as an independent source for the axion's mass which may render the axion more massive than the mixing the bare axion with π an eta.

45662 Topological excitations in the Abelian Higgs model. Einhorn, M.B.; Savit, R. (Physics Department, University of Michigan, Ann Arbor, Michigan 48104). *Phys. Rev., D;* **17**: No. 10, 2583-2594(15 May 1978).

A lattice version of the Abelian Higgs model is studied in arbitrary Euclidean dimension. Using an exact duality transformation, the theory is rewritten in terms of its topological excitations. The dual form of the theory specifies in a simple way all the allowed topological excitations as well as their interactions. The combination of the scalar Higgs field and the Abelian gauge field produces excitations found neither in the pure gauge theory nor in the pure scalar theory (X-Y model). In three dimensions, for example, we find finite vortex strings terminating on monopoles, as well as closed vortex loops. Implications of these singularities for the critical behavior of the theory are briefly discussed.

45663 Path-integral quantization of solitons using the zero-mode Feynman rule. Sung Sheng Chang. (Physics Department, Syracuse University, Syracuse, New York 13210). *Phys. Rev., D;* **17**: No. 10, 2595-2610(15 May 1978).

We propose a direct expansion treatment to quantize solitons without collective coordinates. Feynman's path integral for a free particle subject to an external force is directly used as the generating functional for the zero-frequency mode. The generating functional has no infrared singularity and defines a zero-mode Feynman rule which also gives a correct perturbative expansion for the harmonic-oscillator Green's function by treating the quadratic potential as a perturbation. We use the zero-mode Feynman rule to calculate the energy shift due to the second-order quantum corrections for solitons. Our result agrees with previous predictions using the collective-coordinate method or the method of Goldstone and Jackiw.

45664 Higgs mechanism in the temporal gauge. Creutz, M.; Tudron, T.N. (Physics Department, Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., D;* **17**: No. 10, 2619-2623(15 May 1978).

Working in the temporal gauge $A_0 = 0$, we study canonical quantization of the Higgs model for giving masses to a gauge field. This gauge differs from those discussed previously in that the symmetry of the theory is not spontaneously broken and the Higgs scalar field does not acquire a vacuum expectation value. Rather, the vector meson acquires its mass through a restoration of symmetry of the vacuum under gauge transformations that do not vanish at spatial infinity.

45665 Classification of SU(2) gauge fields. Wang, L.; Ning Yang, C. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., D;* **17**: No. 10, 2687-2694(15 May 1978).

Can two SU(2) gauge fields at one space-time point share the same quadratic Lorentz invariants, yet be not gauge-Lorentz equivalent to each other The analysis of this question leads to a classification of SU(2) gauge field at one space-time point.

45666 Toward a theory of the strong interactions. Callan, C.G. Jr.; Dashen, R.; Gross, D.J. (Institute for Advanced Study, Princeton, New Jersey 08540). *Phys. Rev., D;* **17**: No. 10, 2717-2763(15 May 1978).

A systematic study is made of the relevant degrees of freedom and the dynamics of quantum chromodynamics (QCD). We find that the dynamical properties of QCD are, to a large extent, a consequence of the structure of the vacuum arising from the tunneling

between degenerate, classically stable, vacuums, and that the relevant degrees of freedom can be taken to be the Euclidean path histories that can be used to calculate the tunneling in the semiclassical approximation. This nonperturbative vacuum structure appears well suited to the major features of QCD, i.e., the dimensional transmutation that determines the size of the hadrons and the strong-interaction coupling constant, the source of dynamical chiral symmetry breaking, and the mechanism responsible for quark confinement.

45667 Local supersymmetry transformations and fermion solutions in the presence of instantons. Abbott, L.F.; Grisaru, M.T. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *Phys. Rev., D;* **17**: No. 10, 2809-2812(15 May 1978).

Local supersymmetry transformations are used to generate solutions of the Dirac equation in the presence of instantons. We show that all spin-1/2 zero-eigenvalue modes for an isovector fermion in an N-instanton field can be obtained by spacetime-dependent supersymmetry transformations, and that through additional supersymmetry operations these can be used to generate zero-eigenvalue solutions to the small-fluctuations problem for the Yang-Mills field. Similar problems for supergravity theories with a gravitational instanton are also discussed.

45668 Quantum Electrodynamics Within the Framework of a New Four-Dimensional Symmetry. Hus, J.P. (Space Sciences Laboratory, Marshall Space Flight Center, Huntsville, Alabama). *Found. Phys.;* **8**: No. 5, 371-391(May 1978).

We discuss quantum electrodynamics within the framework of a new four-dimensional symmetry in which the concept of time, the propagation of light, and the transformation property of many physical quantities are drastically different from those in special relativity. However, they are consistent with experiments. The new framework allows for natural developments of additional concepts. Observers in different frames may use the same grid of clocks, located in any one of the frames, and hence have a universal time.

45669 Testing quantum chromodynamics in the hadroproduction of real and virtural photons. Halzen, F.; Scott, D.M. (University of Wisconsin, Department of Physics, Madison, Wisconsin 53706). *Phys. Rev. Lett.;* **40**: No. 17, 1117-1120(24 Apr 1978).

We examine tests of quantum chromodynamics in the production of lepton pairs in hadronic collisions. We emphasize the need for detailed experimental studies of the transverse spectra of lepton pairs. As a further test, we calculate the production of real photons at high transverse momentum. γ/π ratios at the 10% level are predicted for p/sub T/ = 4—6 GeV, with $(pp \rightarrow \gamma X) \cong (pp \rightarrow \pi X)$ at p/sub T/ ≅ 10 GeV.

45670 Static limit of quantum chromodynamics. Appelquist, T.; Dine, M.; Muzinich, I.J. (J. Willard Gibbs Laboratory, Yale University, New Haven, Connecticut 06520). *Phys. Rev., D;* **17**: No. 8, 2074-2081(15 Apr 1978).

Several features of the static quark-antiquark potential in quantum chromodynamics are studied. It is shown, first of all, that the potential between fixed color sources exists as the infinite-mass limit of the interaction between a heavy quark and antiquark. The phenomenological consequences of this result are summarized. The potential is then examined as an expansion in the strong-coupling constant α/sub s/ using the Wilson loop integral. Infrared properties are elucidated and the power-series expansion in α/sub s/ is shown to break down. The quantum color correlations of the quark sources with the gluon field induce singularities which can only be removed by selective resummation. The resulting expression for the potential is nonanalytic in α/sub s/ at α/sub s/ = 0.

45671 Interpretation of small variations of an n-pseudoparticle solution. Stump, D.R. (Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627). *Phys. Rev., D;* **17**: No. 8, 2126-2133(15 Apr 1978).

The small variations of a particular n-pseudoparticle solution which leave the field tensor self-dual are examined. In the case of n widely separated pseudoparticles, they are shown to be variations of the positions, scales, and orientations in group space of the individual pseudoparticles. The variations are written in both the background field gauge and the simpler Lorentz gauge. As an example, a two-pseudoparticle solution with widely separated pseudoparticles of different orientations in group space is exhibited.

45672 Gribov ambiguities in the U gauge. Balachandran, A.P.; Mani, H.S.; Ramachandran, R.; Sharan, P. (Physics Department, Syracuse University, Syracuse, New York 13210). *Phys. Rev. Lett.;* **40**: No. 15, 988-990(10 Apr 1978).

For both Abelian and non-Abelian gauge theories, we find gauge transformations which map fields in the U gauge to other fields in the U gauge. These transformations are not contained in the surviving gauge symmetry after spontaneous breaking (defined as the little group of the vacuum expectation value of the Higgs field). They have both discrete and continuous elements.

45673 Charmonium and quantum chromodynamics. Vainshtein, A.I.; Voloshin, M.B.; Zakharov, V.I.; Novikov, V.A.; Okun', L.B.; Shifman, M.A. (Institute of Theoretical and Experimental Physics, Moscow). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 10, 796-818(Oct 1977).

The properties of levels of charmonium: the bound system consisting of the charmed quark c-bar and antiquark c-bar: are considered. A brief review is given of the experimental data on the different levels of charmonium, and the classification of the states and their decays are discussed. Of the latter, radiative transitions between levels and the annihilation of levels of charmonium to give photons (or lepton pairs), and also light hadrons (π, eta and K mesons), are paid the most attention. Such decays have fundamental significance, inasmuch as they are connected in the most direct manner with the properties of quarks and their interactions. The theoretical foundation of the review is quantum chromodynamics: the theory of the interaction of colored quarks and gluons. The review contains the results of calculations performed in the framework of quantum chromodynamics and pertaining to the annihilation decays of charmonium levels and also to other phenomena: photoproduction of charmed particles, leptonic decays of charmed particles, and nonleptonic decays of strange particles.

45674 Composite model of mesons in relativistic configuration space. Amirkhanov, I.V.; Grusha, G.V.; Mir-Kasimov, R.M. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 107-110(Jul 1977).

A composite model of mesons is constructed on the basis of the simplified version of the relativistic three-dimensional two-body equation (the quasipotential equation in terms of rapidities). The investigation is carried out in terms of the relative distance r, which is canonically conjugate to the rapidities in the sense of Fourier analysis on the Lorentz group. The interaction between quarks is described by a linear potential. A satisfactory description of the masses and leptonic widths of vector mesons is obtained. The energies of radial and orbital excitations in pp-bar, λlambda-bar, and cc-bar systems are found. A model based on the quantum field theory with the fundamental length l_0 is also considered. The geometrical nature of the variable, which here stands for the rapidity, reflects the new properties of the interaction at very small distances. The quark mass corresponds to the "maximon" mass $M = h/l_0c = \sqrt{h^3/cG}$/sub F/=300GeV (G/sub F/ is the Fermi constant).

45675 Infrared singularities and suppression of bosons in massless Abelian gauge theory. Miranskii, V.A.; Sitenko, Y.A.; Fomin, P.I. (Institute of Theoretical Physics, Academy of Sciences of the Ukrainian SSR). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 689-694(Jun 1977).

Infrared singularities in massless Abelian gauge theory are studied taking into account degeneracy of states. The vacuum polarization causes the physical charge to vanish and suppresses real excitations of the boson field. Nevertheless, in this theory there is a neutral current interaction between fermions. It is concluded that charged massless fermions cannot exist.

45676 Processes with fermion exchange in nonabelian gauge theories. Fadin, V.S.; Sherman, V.E. (Nuclear Physics Institute, Siberian Branch, USSR Academy of Sciences). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 861-870(May 1977).

The amplitudes of elastic and inelastic processes with fermion exchange in channels with small momentum transfers in multireggeon kinematics are calculated in the leading logarithmic approximation for nonabelian gauge theories in which the mass arises by the Higgs mechanism. Integral equations are derived for the partial amplitudes of the elastic processes.

SCATTERING THEORY

45677 Dispersion approach to the calculation of three-particle bound states and contributions of three-particle unitarity. Grach, I.L.; Narodetskii, I.M.; Shmatikov , M.Z. (Institute of Theoretical and Experimental Physics). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 410-414(5 Oct 1977).

The following are demonstrated: 1) the equivalence of the single-channel N/D method to the pole approximation in the Amado model, and 2) the need for taking into account three-particle, s-channel unitarity in the calculation (within the framework of the dispersion method) of the ground and excited states of a three-particle system.

45678 Application of the method of formal series to the problem of many-channel potential scattering. Atanasov, A.A. (Plovdiv University, Plovdiv, Bulgaria). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 40-42(Jul 1977).

The method of formal series is employed in order to solve the system of phase equations describing many-channel potential scattering in the case of regular potentials.

45679 Faddeev's equations and the strong-coupling method. Yakubovskii, O.A. (Leningrad State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 694-697(Jun 1977).

A method based on Faddeev's equations is proposed for constructing approximate integral equations for the non-relativistic three-body scattering problem analogous to the equations of the method of strong channel coupling.

PHYSICS RESEARCH (CONT.)

NUCLEAR PHYSICS

45680 (ORO—2408-124) **Studies of nuclear processes. Progress report, 1 January 1977—31 December 1977.** (North Carolina Univ., Chapel Hill (USA)). 1977. Contract EY-76-S-05-2408. 38p. Dep. NTIS, PC A03/MF A01.

Research during this period is summarized in a number of brief reports (most less than one page in length); some of these are in fact the abstracts of published work. It may reasonably be assumed that completed work will be presented in appropriate reports and journals. Topics included in this report are the following: proton-induced nuclear interactions; deuteron-induced nuclear interactions; polarized source upgrading; developments in equipment and technique; nuclear and atomic theory investigations; atomic effects in nuclear bombardment; summary of related activities; and lists of publications, personnel, etc. (RWR)

EXPERIMENTAL TECHNIQUES

45681 Establishment of equilibrium between the nuclear and electron subsystems on dynamic cooling of nuclei. Buishvili, L.L.; Grupp, H.; Davituliani, A.A. (Tbilisi State University). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 983-986(May 1977).

The dynamics of nuclear spins in conditions of nuclear dynamic cooling is investigated. The process of establishment of the stationary polarization is analyzed for various intensities of the alternating magnetic field. An equation describing the nuclear polarization process in the case of a strong saturating field at low temperatures is obtained.

NUCLEAR PROPERTIES AND REACTIONS, A=1-5, THEORETICAL

MASS, ABUNDANCE, AND BINDING ENERGY

45682 Nonlocal contributions to the rho-ω mixing charge-symmetry- breaking force. Friar, J.L.; Gibson, B.F. (Theoretical Division, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev., C;* **17**: No. 5, 1752-1762(May 1978).

Nonlocal contributions of order $(1/m)^2$ to the rho-ω mixing charge-symmetry-breaking nucleon-nucleon force are derived, including several aspects not previously considered. Numerical results for scattering lengths and effective ranges are generated which indicate a slightly larger effect than that found recently by others. The relativistic aspects of this force and its relationship to the electromagnetic Breit interaction are developed. The total correction due to all the $(1/m^2)$ terms is approximately 10%. We estimate that ΔE (Pu3He-^{3}H) = +40$^+$ 45/sub -/15 keV is due to the rho-ω force.

45683 Charge asymmetry in ^{3}He-^{3}H and the neutron-proton mass difference. Friar, J.L.; Gibson, B.F. (Theoretical Division, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev., C;* **17**: No. 4, 1456-1460(Apr 1978).

The dynamical effect of the neutron-proton mass difference on charge asymmetry in the trinucleon system is investigated using perturbation theory and the Faddeev equations. The mixed symmetry components of the wave function play an unexpectedly critical role and reduce the effect by roughly a factor of 2 from simple estimates. A reduction rather than an enhancement occurs because the neutron-proton force is stronger than the neutron-neutron or proton-proton forces.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45718

45684 Distorted-wave Born-approximation description of the ^{4}He(p,d)^{3}He reaction at E/sub p/ = 770 MeV. Rost, E.; Shepard, J.R.; Sparrow, D.A. (Nuclear Physics Laboratory, Department of Physics and Astrophysics, University of Colorado, Boulder, Colorado 80309). *Phys. Rev., C;* **17**: No. 4, 1513-1515(Apr 1978).

The exact finite-range, distorted-wave Born approximation was used to compute ^{4}He(p,d)^{3}He cross sections at E/sub p/ = 770 MeV. The transition form factor was tied to measured electron-^{4}He scattering and the calculated cross sections were insensitive to uncertainties in the distorting potentials. The calculated angular distributions do not reproduce the data.

45685 Neutron-proton bremsstrahlung results at 200 MeV. Bohannon, G.E. (Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev., C;* **17**: No. 3, 865-871(Mar 1978).

Neutron-proton bremsstrahlung cross sections dsigma-dash-bardΩ/sub p/dΩ/sub n/ and asymmetries at E/sub lab/ = 200 MeV have been calculated using the Lomon-Feshbach and Hamada-Johnston models. The cross sections from these models differ by about 10% at θ/sub p/ = θ/sub n/ = 30^0 after approximate adjustments are made for elastic scattering differences. The cross sections integrated over only the larger peak in the θ/sub γ/ distribution differ by about 16%. The calculations are based on an expansion of the electromagnetic current in powers of the photon energy rather than an expansion of the complete bremsstrahlung matrix element. The calculation includes the external emission amplitude to all orders in the photon energy and the electric dipole part of the internal emission amplitude. Higher order contributions to the internal emission amplitude are discussed. The numerical results and amplitude expressions are compared with those of other authors. We find numerical agreement with Brown and Franklin but not with Celenza, Gibson, Liou, and Sobel.

45686 Sum rules for elastic nd scattering. Takibaev, N.Z. (P. N. Lebedev Physical Institute, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 42-43(Jul 1977).

Sum rules relating the s-wave phase shifts of doublet and quartet nd scattering with the binding energy of the triton are obtained which agree with experiment.

NUCLEAR PROPERTIES AND REACTIONS, A=1-5, EXPERIMENTAL

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45705

45687 Elastic electron scattering from ^{3}He and ^{4}He at high momentum transfer. Arnold, R.G.; Chertok, B.T.; Rock, S.; Schuetz, W.P.; Szalata, Z.M.; Day, D.; McCarthy, J.S.; Martin, F.; Mecking, B.A.; Sick, I.; Tamas, G. (American University, Washington, D. C. 20016). *Phys. Rev. Lett.;* **40**: No. 22, 1429-1432(29 May 1978).

Experimental values of ^{3}He (^{4}He) elastic structure functions up to momentum transfer q^2 = 4.0 (2.4) $(GeV/c)^2$ are presented. They are compared to calculations using three- and four-body wave functions and to asymptotic models.

45688 Fragmentation of ^{4}He, ^{12}C, ^{14}N, and ^{16}O nuclei in nuclear emulsion at 2.1 GeV/nucleon. Heckman, H.H.; Greiner, D.E.; Lindstrom, P.J.; Shwe, H. (Lawrence Berkeley Laboratory and Space Sciences Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 5, 1735-1747(May 1978).

A comparative study of the fragmentationof ^{4}He, ^{12}C, ^{14}N, and ^{16}O nuclei, E = 2.1 GeV/nucleon, has been made by using nuclear emulsion detectors. The interaction mean-free paths (cm) for these nuclei in emulsion are 21.8 +- 0.7, 13.8 +- 0.5, 13.1 +- 0.5, and 13.0 +- 0.5, respectively. These data are discussed in terms of optical models and geometrical theories. Fragmentation reactions initiated by ^{12}C, ^{14}N, and ^{16}O projectiles that exhibit no target excitation, i.e., that possess no low energy particle emission, are selected for special study of projectile fragmentation. The projected angular distributions of Z = 1 and 2 secondaries from these interactions are reported, as are the prong-number and charge-multiplicity distributions. The angular distributions are independent of the projectile and exhibit features of limiting fragmentation.

45689 π^+ + d → p + p reaction at 40, 50, and 60 MeV. Preedom, B.M.; Darden, C.W.; Edge, R.D.; Marks, T.; Saltmarsh, M.J.; Gabathuler, K.; Gross, E.E.; Ludemann, C.A.; Bertin, P.Y.; Blecher, M.; Gotow, K.; Alster, J.; Burman, R.L.; Perroud, J.P.; Redwine, R.P. (Physics Department, University of South Carolina, Columbia, South Carolina 29208). *Phys. Rev., C;* **17**: No. 4, 1402-1408(Apr 1978).

Absolute differential cross sections have been measured for the π^+ + d → p + p reaction at pion energies of 40, 50, and 60

MeV. The angular distributions are fitted with the functional form $C_0 + C_2\cos^2\theta + C_4\cos^4\theta$.

45690 Neutron scattering lengths for ^{3}He. Alfimenkov, V.P.; Akopyan, G.G.; Wierzbicki, J.; Govorov, A.M.; Pikel'ner, L.B.; Sharapov, E.I. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 607-609(Jun 1977).

The total cross section for scattering of neutrons by the ^{3}He nucleus has been measured in the neutron energy range 0.02—2 eV. The value obtained, together with other data, is used to determine the neutron scattering length.

NUCLEAR PROPERTIES AND REACTIONS, A=6-19 THEORETICAL

MASS, ABUNDANCE, AND BINDING ENERGY

45691 Pion-exchange contributions to charge densities of closed-shell nuclei. Negele, J.W.; Riska, D.O. (Center for Theoretical Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev. Lett.;* **40**: No. 15, 1005-1008(10 Apr 1978).

The contribution to the nuclear charge density of the two-body pion-exchange charge operator is calculated for close-shell nuclei from ^{12}C to ^{208}Pb using density-dependent Hartree-Fock wave functions.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45806

45692 ^{14}C(t,p)^{16}C reaction at 23 MeV. Sercely, R.R.; Peterson, R.J.; Flynn, E.R. (Department of Physics and Astrophysics, University of Colorado, Boulder, Colorado). *Phys. Rev., C;* **17**: No. 6, 1919-1923(Jun 1978).

The (t,p) two nucleon transfer reaction has been studied on ^{12}C and ^{14}C at a beam energy of 23 MeV with an overall final resolution of better than 30 keV. A new mass excess of + 13.692 +- 0.004 MeV is inferred for the ^{16}C ground state. Seven final states of ^{16}C are noted, and angular distributions are measured for six of these.

45693 Core-polarization and exchange-current effects on the magnetic form factor of ^{17}O. Arima, A.; Horikawa, Y.; Hyuga, H.; Suzuki, T. (Department of Physics, State University of New York, Stony Brook, New York 11794). *Phys. Rev. Lett.;* **40**: No. 15, 1001-1004(10 Apr 1978).

The magnetic form factor of ^{17}O is studied by taking account of the effects of core polarization and mesonic exchange currents. It is shown that the M3 part of the single-particle value is strongly canceled out by the core polarization.

45694 Translational invariance effects in octupole excitations of deformed nuclei. Baznat, M.I.; Pyatov, N.I.; Salamov, D.I. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 613-617(Jun 1977).

A method is proposed for reestablishing the translational invariance of a certain class of model microscopic Hamiltonians. The effects of translational invariance in octupole excitations of deformed nuclei are studied on the basis of a simple model.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45808

45695 Three-dimensional time-dependent Hartree-Fock calculations: Application to ^{16}O + ^{16}O collisions. Flocard, H.; Koonin, S.E.; Weiss, M.S. (Nuclear Science Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 5, 1682-1699(May 1978).

A coordinate-space method is developed to solve the three-dimensional time-dependent Hartree-Fock equations. It is applied to the study of ^{16}O + ^{16}O collisions at E/sub lab/ = 105 MeV for incident angular momenta from 0 to 40h. We find fusion for L = 13h through 27h and highly inelastic scattering for L < or = 1/2h.

45696 Model-independent analysis of the inverse electroproduction of pions at 276 MeV. Berezhnev, S.F.; Blokhintseva, T.D.; Nemenov, L.L. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 657-659(Jun 1977).

A phenomenological analysis is made of data on the reaction $\pi^- + p \rightarrow e^+ + e^- + n$ at 276 MeV. The contributions to the cross section for this reaction from states with various polarizations of the virtual photon are determined by a model-independent procedure. The results are compared with the predictions of a dispersion model. The production cross section for a scalar photon is determined. A model-independent method of measuring the Dirac isovector form factor of the nucleon is proposed.

NUCLEAR PROPERTIES AND REACTIONS, A=6-19, EXPERIMENTAL

MASS, ABUNDANCE, AND BINDING ENERGY

45697 Pion double-charge exchange on ^{16}O and ^{18}O. Burman, R.L.; Baker, M.P.; Cooper, M.D.; Heffner, R.H.; Lee, D.M.; Redwine, R.P.; Spencer, J.E.; Marks, T.; Malbrough, D.J.; Preedom, B.M.; Holt, R.J.; Zeidman, B. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev., C;* **17**: No. 5, 1774-1786(May 1978).

The zero-degree differential cross section for pion double-charge exchange on ^{18}O(π^+,π^+-)^{18}Ne was measured at three incident pion energies and found to be 2.00 +- 0.34, 2.19 +- 0.44, and 1.67 +- 0.38 μb/sr at 139, 126, and 95 MeV, respectively. A similar measurement for ^{16}O at an energy of 145 MeV resulted in a value of 0.87 +- 0.21 μb/sr. The ratio of the ground-state transitions near 140 MeV is $\sigma(^{18}O)/\sigma(^{16}O) = 2.3 +- 0.7$. The mass excess determined for ^{16}Ne is 24.4 +- 0.5 MeV. The experimental setup and data analysis are discussed in detail. Results are compared with various calculations and discussed from the standpoint of their implications for learning about reaction dynamics and nuclear structure. The reaction appears to be quite sensitive to ground-state correlations of the target.

RADIOACTIVE DECAY

45698 Core excited T = 2 levels in A = 12 from studies of ^{12}Be. Alburger, D.E.; Balamuth, D.P.; Lind, J.M.; Mulligan, L.; Young, K.C. Jr.; Zurmuehle, R.W.; Middleton, R. (Brookhaven National Laboratory, Upton, L.I., New York 11973). *Phys. Rev., C;* **17**: No. 5, 1525-1530(May 1978).

Levels of ^{12}Be have been studied using the ^{10}Be(t,p) ^{12}Be reaction. The spin of an excited state at E/sub x/ = 2.110 +- 0.015 MeV is determined model independently as J = 2 using a measurement of the proton-γ angular correlation in an axially symmetric geometry. A mechanically chopped beam was used to study β activity following the irradiation of ^{10}Be by 12 MeV tritons. A least squares analysis of the resulting decay curve yields T/sub 1/2/(^{12}Be) = 24.4 +- 3.0 msec. A ^{3}He neutron detector was used to search for delayed neutrons; a 1σ upper limit on a delayed neutron branch of 1% is obtained. The above results support the suggestion that low-lying states in ^{12}Be involve the excitation of particles into the 1s-0d shell.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45697, 45698, 45705

45699 Population of resonant ^{12}C + ^{12}C states via the reaction ^{12}C(^{16}O, α)^{24}Mg. Lazzarini, A.J.; Cosman, E.R.; Sperduto, A.; Steadman, S.G.; Thoms, W.; Young, G.R. (Laboratory for Nuclear Science, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev. Lett.;* **40**: No. 22, 1426-1429(29 May 1978).

Excitation functions for the reaction ^{12}C(^{16}O, α)^{24}Mg have been measured from E/sub lab/(^{16}O) = 62 to 110 MeV using a counter telescope at θ/sub lab/ = 7.5°. Selective population of relatively few states at very high excitation energies in ^{24}Mg[E/sub x/(^{24}Mg) > 20 MeV] is seen. A possible correspondence is found between these states and the narrow resonances reported in ^{12}C + ^{12}C reactions. In addition, a possible correspondence between averaged yields in ^{12}C(^{16}O, α)^{24}Mg and gross structure seen in serveral ^{12}C + ^{12}C reaction channels is cited.

NUCLEAR REACTIONS AND SCATTERING

45700 Elastic scattering of 162-MeV pions by nuclei. Zeidman, B.; Olmer, C.; Geesaman, D.F.; Boudrie, R.L.; Siemssen, R.H.; Amann, J.F.; Morris, C.L.; Thiessen, H.A.; Burleson, G.R.; Devereux, M.J.; Segel, R.E.; Swenson, L.W. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev. Lett.;* **40**: No. 20, 1316-1320(15 May 1978).

The elastic scattering of 162-MeV π^+ and π^- ^{9}Be, Si, ^{58}Ni and ^{208}Pb have been measured. All angular distributions, except for ^{9}Be, exhibit strong diffraction patterns. Optical-model calculations with matter distributions deduced from electron scattering qualitatively reproduce the data, but better agreement for all but ^{9}Be can be obtained with suitable modifications. No substantial differences in neutron- and proton-matter radii are indicated.

45701 Structure in the Radiative Capture of ^{12}C by ^{12}C near the coulomb barrier. Nathan, A.M.; Sandorfi, A.M. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev. Lett.;* **40**: No. 19, 1252-1255(8 May 1978).

The yield curves of high-energy capture γ rays from ^{12}C ($^{12}C,\gamma_0$) and $^{12}C(^{12}C,\gamma_1)$ were measured at Θ/sub lab/ = 45° from E/sub c.m./ = 5.0 to 11.0 MeV. A J/sup π/ = 2⁺ resonance, with a width (full width at half-maximum) of 261 +- 74 keV and a peak cross section at 45° of 44.3 +- 4.5 nb/sr, was observed in $^{12}C(^{12}C,\gamma_0)$ at (21.98 +- 0.03) MeV excitation in ^{24}Mg. Several other resonant features were also observed in the γ-ray yields.

45702 Analyzing power in proton-nucleus elastic scattering at 0.8 GeV. Hoffman, G.W.; Blanpied, G.S.; Coker, W.R.; Liljestrand, R.P.; Hintz, N.M.; Oothoudt, M.A.; Bauer, T.S.; Igo, G.; Pauletta, G.; Soukup, J.; Whitten, C.A. Jr.; Madland, D.; Pratt, J.C.; Ray, L.; Spencer, J.E.; Thiessen, H.A.; Nann, H.; Seth, K.K.; Glashausser, C.; McDaniels, D.K.; Tinsley, J.; Varghese, P. (University of Texas, Austin,Texas 78712). *Phys. Rev. Lett.;* **40**: No. 19, 1256-1259(8 May 1978).

The first elastic-scattering analyzing-power (A/sub y/) data at 0.8 GeV are presented and discussed. Angular distributions of A/sub y/ over the range 2° to 20° (30° for ^{12}C) have been obtained for ^{12}C, ^{58}Ni, ^{90}Zr, and ^{208}Pb using the high-resolution spectrometer at the Clinton P. Anderson Meson physics Facility. The analyzing powers osillcate sharply over positive values in qualitative agreement with expectations.

45703 $^{18}O + ^{12}C$ and $^{18}O + ^{13}C$ fusion-evaporation reactions. Coffin, J.P.; Engelstein, P.; Gallmann, A.; Heusch, B.; Wagner, P.; Wegner, H.E. (Centre de Recherches Nucleaires et Universite Louis Pasteur, Strasbourg, France). *Phys. Rev., C;* **17**: No. 5, 1607-1614(May 1978).

The evaporation residues of the $^{18}O + ^{12}C$ and $^{18}O + ^{13}C$ reactions have been identified by nuclear charge Z and atomic mass A with an ionization chamber used in conjunction with time-of-flight measurements. A dominant decay mode can be assigned for each residual nucleus from the shape of the angular distributions. The predictions of two different evaporation calculations are in satisfactory agreement with the experimental results except for an anomalously large ^{23}Na experimental yield in both reactions which cannot be explained. The evaporation schemes of the two neighboring compound nuclei ^{30}Si and ^{31}Si, formed at nearly equal excitation energy and spin, are compared.

45704 Neutron-induced deuteron production from light nuclei at 800 MeV. Riley, P.J.; Bjork, C.W.; Newsom, C.R.; Kenefick, R.A.; Evans, M.L.; Glass, G.; Hiebert, J.; Jain, M.; Northcliffe, L.C.; Bonner, B.E.; Simmons, J.E.; Stein, N.; Cassapakis, C.G. (University of Texas, Austin, Texas 78712). *Phys. Rev., C;* **17**: No. 5, 1881-1884(May 1978).

The deuteron spectra from (n,d) reactions at 800 MeV near 0° are characterized by a high energy quasielastic scattering peak, and at lower momentum, a quasifree scattering peak. The ratio of the quasifree to quasielastic cross sections is approximately 10 : 1. Both cross sections exhibit an A/sup 1/3/ mass dependence over the range of target nuclei studied. Comparisons are made with corresponding proton-induced quasielastic and quasifree deuteron production.

45705 (t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C. Ajzenberg-Selove, F.; Flynn, E.R.; Hansen, O. (Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania 19104). *Phys. Rev., C;* **17**: No. 4, 1283-1293(Apr 1978).

A study of the (t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C has been carried out using 23 MeV tritons and an Elbek-type spectrograph using photographic emulsions as detectors. A total of 71 states of ^{6}He, ^{8}Li, ^{9}Li, ^{11}Be, ^{12}B, ^{13}B, and ^{14}C have been studied. Some of the states had not been previously reported. In other cases new values of excitation energies and widths are proposed. Attempts have been made to fit the 62 angular distributions we obtained with the distorted-wave Born approximation: no systematic analysis was possible except in the case of L = 0 distributions.

45706 Confirmation of 8^+ assignment to the 11.86 MeV level in ^{24}Mg. Wender, S.A.; Gould, C.R.; Tilley, D.R.; Rickel, D.G.; Zurmuehle, R.W. (North Carolina State University, Raleigh, North Carolina 27607). *Phys. Rev., C;* **17**: No. 4, 1365-1367(Apr 1978).

Linear polarizations of γ rays from the 11.86 → 8.12 → 4.12 MeV decay in ^{24}Mg have been studied with a NaI polarimeter. The 11.86 MeV level was populated via the $^{12}C(^{16}O,\alpha\gamma)^{24}Mg$ reaction. The results are consistent with J/sup π/ = 8⁺ for the 11.86 MeV level and in agreement with earlier work, rule against a 6⁺ assignment with 85% confidence.

45707 Energy spectra of nuclear fragments produced by high energy protons. Westfall, G.D.; Sextro, R.G.; Poskanzer, A.M.; Zebelman, A.M.; Butler, G.W.; Hyde, E.K. (Lawrence Berkeley Laboratory, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 4, 1368-1381(Apr 1978).

Fragment energy spectra from the 2.1- and 4.9-GeV proton irradiation of C, Al, Ag, and U targets were measured at several angles to the beam for products ranging from He up to Ar for the heavier targets. The fragments were detected in a telescope consisting of a gas ΔE counter and a silicon E counter. The carbon target measurements are compared with previous data from projectile fragmentation studies. A Maxwellian type functional form which fits the energy spectra from all the targets is presented. The spectra were integrated to obtain values of the cross section as a function of atomic number.

45708 Elastic scattering of positive pions on ^{16}O at 40.0 and 49.7 MeV. Malbrough, D.J.; Darden, C.W.; Edge, R.D.; Marks, T.; Preedom, B.M.; Burman, R.L.; Moinester, M.A.; Redwine, R.P.; Bertrand, F.E.; Cleary, T.P.; Gross, E.E.; Ludemann, C.A.; Gotow, K. (University of South Carolina, Columbia, South Carolina 29208). *Phys. Rev., C;* **17**: No. 4, 1395-1401(Apr 1978).

Differential cross sections for elastic scattering of positive pions on ^{16}O at 40.0 and 49.7 MeV were measured at about 10° intervals for laboratory angles from 25° to 160°. Relative uncertainties between angles are 3%, with the overall normalization known to 7% for each angular distribution. The angular distributions are similar in shape, being dominated by a minimum at about 60°. The differential cross sections are presented along with the results of a partial wave analysis which gives good fits at both 40.0 and 49.7 MeV. The data are also fitted by a simple phenomenological first-order Kisslinger nonlocal optical model calculation.

45709 Quasielastic scattering of electrons by ^{6}Li, ^{7}Li, and ^{9}Be and the final-state interaction. Kuplennikov, E.L.; Gol'dshtein, V.A.; Afanas'ev, N.G.; Vlasenko, V.G. (Khar'kov Physico-technical Institute, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 599-600(Jun 1977).

The theoretical dependence of the suppression factor for the cross section for quasielastic scattering of electrons on the emitted-proton energy is normalized to the experimental data for the nuclei / sup 6,7/Li and ^{9}Be. The dependence obtained permits the measured values of the quasielastic electron-scattering cross section to be described in terms of the shell model over a wide range of momentum transfers (280< or =s< or =600 MeV/c).

45710 Proton knockout from light nuclei by 170-MeV π^+ mesons. Berdnikov, Y.A.; Gismatullin, Y.R.; Kalimov, A.G.; Ostroumov, V.I. (Leningrad Polytechnic Institute). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 610-612(Jun 1977).

Nuclear emulsions have been used to study the reaction (π^+,π^+ p) in carbon and oxygen nuclei at a π^+-meson energy of 170 MeV. We have obtained the integrated cross section, the momentum and angular distributions of the residual nuclei, the energy spectrum and angular distribution of the protons, and the differential cross section for scattering of π^+ mesons. The experimental results are compared with calculations according to the dispersion theory of direct nuclear reactions. It is shown that the mechanism of direct nucleon knockout provides the dominant contribution to the cross section of the reaction.

NUCLEAR PROPERTIES AND REACTIONS, A=20-38, THEORETICAL

NUCLEAR REACTIONS AND SCATTERING

45711 Heavy-ion fusion based on the proximity potential and one-body friction. Birkelund, J.R.; Huizenga, J.R.; De, J.N.; Sperber, D. (Departments of Chemistry and Physics, and Nuclear Structure Research Laboratory, University of Rochester, Rochester, New York 14627). *Phys. Rev. Lett.;* **40**: No. 17, 1123-1127(24 Apr 1978).

A simple dynamical model is shown to reproduce heavy-ion fusion excitation functions over a wide mass and energy range. The trajectory calculations employ the proximity nuclear potential and the proximity one-body nuclear friction. The importance of tangential friction in determining the magnitude and shape of the fusion excitation functions at higher energies is discussed.

NUCLEAR PROPERTIES AND REACTIONS, A=20-38, EXPERIMENTAL

ENERGY LEVELS AND TRANSITIONS

45712 ^{20}Ne nuclear moments from ^{20}Ne(131 MeV) + ^{208}Pb scattering. Gross, E.E.; Cleary, T.P.; Ford, J.L.C.; Hensley, D.C.;

Toth, K.S. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev., C;* **17**: No. 5, 1665-1671(May 1978).

We have measured differential cross sections for elastic and inelastic scattering of $^{2}0Ne + ^{2}08Pb$ at lab energy of 131 MeV. Inelastic data for exciting the $^{2}0Ne$ 2^{+} (1.63 MeV) state and a group of states near 4.2 MeV are presented. The data are analyzed by a rotational-mode coupled-channels calculation including the ground state, 2^{+}, and 4^{+} states of $^{2}0Ne$. We obtain the values: transition moment B (E2→) = (0.0330 +- 0.0015) $e^{2}b^{2}$, intrinsic hexadecapole moment $Q_{4}0$ = (0.022 +- 0.003) $e^{2}b^{2}$, and static quadrupole moment for the $^{2}0Ne$ 2^{+} state Q_{2} = (- 0.27 +- 0.03) e b. The result for Q_{2} emphasizes a discrepancy with the rotational model and with various shell model calculations.

45713 Alpha-cluster structure of the $^{2}0Ne$ nucleus at excitation energies above 30 MeV. Artemov, K.P.; Gol'dberg, V.Z.; Petrov, I.P.; Rudakov, V.P.; Serikov, I.N.; Timofeev, V.A.; Wolsky, R.; Schmider, J. (I. V. Kurchatov Atomic Energy Institute). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 4-6(Jul 1977).

Measurements of the dα angular correlation in the process $^{1}6O(^{6}Li,d)^{2}0Ne(\alpha)^{1}6O$ at a ^{6}Li energy 57.8 MeV have shown that the α-cluster level 10^{+} located in the $^{2}0Ne$ nucleus at excitation energy near 30 MeV is split into a large number of overlapping components lying in the range of excitation energies 29—36 MeV.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45700, 45707

45714 Complete fusion of /sup 16,18/O with /sup 24,26/Mg. Tabor, S.L.; Geesaman, D.F.; Henning, W.; Kovar, D.G.; Rehm, K.E.; Prosser, F.W. Jr. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 6, 2136-2143(Jun 1978).

Total fusion cross sections for $^{16}O + ^{24}Mg$, $^{16}O + Pu2^{6}Mg$, and $^{18}O + ^{24}Mg$ have been measured in the energy range 18 MeV < or = E/sub c.m./ < or = 50 MeV by detection of the evaporation residues. In addition, elastic scattering angular distributions have been measured and analyzed with the optical model. The fusion cross section for $^{16}O + ^{24}Mg$ saturates at ~ 1100 mb, while that for $^{16}O + ^{26}Mg$ and $^{18}O + ^{24}Mg$ reaches ~ 1200 mb. The fusion cross section excitation functions can be well described by the model of Glas and Mosel using reasonalbe parameters; the model of Bass reproduces the data well above E/sub c.m./ ≅ 25 MeV but overpredicts the cross section below this energy.

45715 Correlated energy spectra of light fragments from 720-MeV α-induced reactions. Doering, R.; Schweizer, T.C.; Thornton, S.T.; Dennis, L.C.; Cordell, K.R.; Ziock, K.O.H.; Comiso, J.C. (Department of Physics, University of Virginia, Charlottesville, Virginia 22901). *Phys. Rev. Lett.;* **40**: No. 22, 1433-1435(29 May 1978).

Double-differential cross sections have been measured for protons, deutrons, tritons, ^{3}He, and ^{4}He at laboratory angles of 60°, 90°, and 120° from targets of Al, Ag, and Ta bombarded with 720-MeV α particles. At a given angle the high-energy $d^{2}\sigma/d\Omega dE$ spectra are very similar in shape, independent of fragment and target. The nuclear fireball and coalescence models are somewhat less consistent with these data than with high-energy heavy-ion obtained with the Bevalac.

45716 Resonant effects in the reaction $^{2}4Mg$ ($^{1}6O,^{1}2C)^{2}8Si. Paul, M.; Sanders, S.J.; Cseh, J.; Geesaman, D.F.; Henning, W.; Kovar, D.G.; Olmer, C.; Schiffer, J.P. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev. Lett.;* **40**: No. 20, 1310-1312(15 May 1978).

Excitation functions were measred at forward angles for the reaction $^{2}4Mg(^{1}6O, ^{1}2C)^{2}8Si$ to the ground and first excited states of $^{2}8Si$. Resonancelike structures were found in both excitation functions with pronounced maxima at center-of-mass energies of ~ 28, ~ 31, and ~ 34 MeV. Angular distributions obtained at these three energies are fitted rather well with P/sub L/^{2}(cosθ with L = 21, 23, and 25, respectively.

NUCLEAR PROPERTIES AND REACTIONS, A=39-58, THEORETICAL

MASS, ABUNDANCE, AND BINDING ENERGY

REFER ALSO TO CITATION(S) 45691

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45711, 45808

45717 Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu. Ford, G.P. (Los Alamos Scientific Lab., NM). *Nucl. Sci. Eng.;* **66**: No. 3, 334-348(Jun 1978).

Nuclear state and level densities as a function of excitation energy, angular momentum, and parity were calculated by a combinatorial method for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu. Single-particle states for both Woods-Saxon and Nilsson potentials were used. These calculations were done with zero and nonzero pairing energy. State densities as a function of excitation energy were calculated by an approximate inversion of exact partition functions; they agree well with state densities calculated by the combinatorial method. Average excitation energy as a function of temperature was calculated from the partition function for each of the nuclei. Level densities as a function of energy, calculated by the combinatorial method, are compared with measured level densities. The agreement is either good or very good for most, but not all, of the nuclei. No evidence was found that must be interpreted as indicating a failure of the independent-particle model at higher excitation energies. For level density calculations with zero pairing energy, there is a suggestion, but no clear indication, that Woods-Saxon single-particle states are better than Nilsson single-particle states. Calculated and measured spin cutoff parameters are compared for ^{56}Fe and ^{61}Cu. Single-particle states for Nilsson-type potentials tend to give higher state and level densities than single-particle states for Woods-Saxon-type potentials. This tendency is not due to the larger number of single-particle states for Nilsson-type potentials, and it can be compensated for by using a nonzero pairing energy. The calculated fraction of negative-parity states is about one-half as expected, but this fraction varies much more than expected from one energy interval to another. The calculated M-value distribution is approximately Gaussian as expected.

45718 Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron. Jiang, S.H.; Werle, H. (Kernforschungszentrum, Karlsruhe, Ger.). *Nucl. Sci. Eng.;* **66**: No. 3, 354-362(Jun 1978).

The ^{252}Cf fission neutron-induced gamma fields in iron were investigated experimentally and theoretically. The gamma leakage spectra from a series of relatively small iron spheres (15 to 35 cm in diameter) and the space-dependent gamma spectra within a relatively large (approximately 100- x 100- x 100-cm) steel pile were measured with an absolutely calibrated Si(Li) Compton spectrometer in the energy range from 0.3 to 3 MeV. In addition, neutron spectra (with a spherical proton recoil proportional counter and a ^{3}He semiconductor spectrometer) and ^{235}U fission rates were measured within the steel pile. The measurements are compared with calculations. For the calculation of the neutron spectra, the one-dimensional neutron transport code DTK (208 energy groups) was used, and for the calculation of the gamma spectra, an extended version (51 energy groups) of the gamma transport code BIGGI 4T and an (n-γ) production cross-section matrix constructed from published data were used. The gamma flux induced by inelastic neutron scattering is well reproduced by the calculations, whereas that induced by capture processes is somewhat underestimated (approximately 20%).

45719 Particle-vibrator model for intermediate structure in neutron scattering from $^{5}6Fe$. Ferguson, J.M. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Rev., C;* **17**: No. 5, 1888-1890(May 1978).

The neutron cross section of $^{5}6Fe$ up to 1 MeV was calculated by the coupled channels methods, using a simple vibrational model. It was found that intermediate structure observed in s-wave scattering from $^{5}6Fe$ may be accounted for by this model. By modifying the coupled channels code to calculate bound states, it was also found that the general features of the measured distributions of spectroscopic factors are accounted for by this model.

45720 Perturbation formalism for the complex poles and widths of the transition matrix with an application to intermediate structure phenomena. Perez, R.B.; de Saussure, G.; Olsen, D.K.; Difilippo, F.C. (Oak Ridge National Laboratory, Neutron Physics Division, P.O. Box X, Oak Ridge, Tennessee 37830). *Phys. Rev., C;* **17**: No. 3, 964-977(Mar 1978).

The complex poles and widths of the transition T matrix are determined by the trajectory equations which consist of a set of first order nonlinear differential equations. A hierarchy of approximate solutions to the trajectory equations is developed by iterative methods. The results of this formalism are compared with exact solutions for the case of some strongly interacting pairs of resonances in two iron isotopes. In the presence of intermediate structure the average neutron reaction cross section is interpreted in terms of a resonant strength function which exhibits peaks at neutron energies corresponding to "doorways" levels.

NUCLEAR PROPERTIES AND REACTIONS, A=39-58, EXPERIMENTAL

RADIOACTIVE DECAY

45721 Mass and β decay of the new isotope ^{57}Cr. Davids, C.N.; Geesaman, D.F.; Tabor, S.L.; Murphy, M.J.; Norman, E.B.; Pardo, R.C. (Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 5, 1815-1821(May 1978).

The new isotope ^{57}Cr was produced via the ^{48}Ca(^{11}b, pn)^{57}Cr reaction at E/sub 11B/ = 21 MeV. Delayed singles γ spectra, and γ-γ and β-γ coincidences were measured, using large Ge(Li) detectors and a plastic scintillator. The half-life of ^{57}Cr was measured to be 21.1 +- 1.0 s, and its ground-state spin and parity have been assigned as 3/2$^-$. Spin restrictions have been placed on a number of levels in the daughter nucleus ^{57}Mn. The mass excess of ^{57}Cr was determined to be -52.39 +- 0.10 MeV. The measured ^{57}Cr mass excess is compared with various predictions.

45722 Lifetime and γ decay of the isomeric 19/2$^-$ state in ^{43}Ti. Meyer-Schuetzmeister, L.; Elwyn, A.J.; Rehm, K.E.; Hardie, G. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 4, 1299-1307(Apr 1978).

The nucleus ^{43}Ti has been studied by prompt and delayed n-γ and γ-γ coincidences in the bombardment of ^{40}Ca with 20-MeV α particles. A cascade of three γ rays with energies of 114.7, 1094.0, and 1857.7 keV has been observed. The γ cascade is emitted by an isomeric state of 3066.4-keV excitation energy; its mean life has been determined to be tau = 810 +- 50 nsec. By measuring the relative intensities of the three γ rays the sequence in the γ decay has been established. The close resemblance of this γ cascade to the one in the mirror nucleus ^{43}Sc leads to the conclusion that the 3066.4-keV state in ^{43}Ti is an isomeric 19/2$^-$ state which has the decay scheme 19/2$^-$/sub 114.7/→15/2$^-$ (2952.7)/sub 1094.0/→11/ 2$^-$ (1857.7 → 7/2$^-$ (σ). This conclusion is in agreement with the results of measured excitation functions which show that the maximum yield of the 1857.7-keV γ occurs at the lowest α energy and that of the 114.7-keV γ at the highest. The B (E2) value of the 19/2$^-$ → 15/2$^-$ transition in ^{43}Ti is larger by nearly a factor of 2 than the corresponding transition in ^{43}Sc. The slightly lower excitation energy (56.9 keV) of the 19/2$^-$ state in ^{43}Ti with respect to the corresponding state in ^{43}Sc seems to be at least partially due to Coulomb shifts arising from the two valence protons in ^{43}Ti.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45721

45723 Nuclear data sheets for A=46. Auble, R.L. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Nucl. Data Sheets;* **24**: No. 1, 1-56(May 1978).

Nuclear structure data available through January 1978 are compiled and evaluated. Adopted level and decay properties are given. The bulk of the data is presented pictorially for easy comparison. Experimental details, references, and additional comments, where required, are given in the text. All drawings, tables, and comments are reproduced from the evaluated nuclear structure data file (ENSDF). Any additions or corrections desired by the users should be addressed to the evaluators for maintenance and updating of the data file.

45724 Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn. Nathan, A.M.; Olness, J.W.; Warburton, E.K.; McGrory, J.B. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., C;* **17**: No. 3, 1008-1025(Mar 1978).

Fusion-evaporation reactions induced by beams of 25—65 MeV ^{13}C, ^{15}N, ^{11}B, and ^{9}Be on an isotopically enriched ^{48}Ca target have been used to populate high-spin yrast levels in /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn. Measurements consisted of γ-ray excitation functions, angular distributions, γ-γ coincidences, and recoil-distance and Doppler shift lifetime measurements, from which were deduced the enrgy levels, γ-ray branching ratios, most probable spin-parity assignments, and level lifetimes. Comparision is made with a large-basis shell model calculation.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45700, 45702

45725 ^{16}O + ^{40}Ca inelastic scattering and direct-reaction calculations in heavy-ion scattering. Rehm, K.E.; Henning, W.; Erskine, J.R.; Kovar, D.G. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev. Lett.;* **40**: No. 23, 1479-1482(5 Jun 1978).

Inelastic scattering to the lowest 2$^+$, 3$^-$, and 5$^-$ states in ^{40}Ca was studied for ^{16}O + ^{40}Ca at E/sub lab/(^{16}O) = 60 MeV. The angular distributions are compared to distorted-wave and coupled-channel Born-approximation predictions. The results show that the effect of the 3$^-$ inelastic excitation on the elastic scattering wave function has to be treated explicitly in order to reproduce the angular distributions. This is particularly evident for the 5$^-$ transition, despite the fact that direct coupling between the 3$^-$ and 5$^-$ states is negligible.

45726 Recoil distance lifetime measurements in ^{69}As and ^{72}Se. Hellmeister, H.P.; Schmidt, E.; Uhrmacher, M.; Rascher, R.; Lieb, K.P.; Pantelica, D. (Institut fuer Kernphysik der Universitaet zu Koeln, 5000 Koeln 41, Germany). *Phys. Rev., C;* **17**: No. 6, 2113-2125(Jun 1978).

High spin states in ^{69}As and ^{72}Se have been excited in oxygen induced reactions on ^{55}Mn, /sup 54,56/Fe, and ^{58}Ni targets. On the basis of $\gamma\gamma$ coincidences, angular distributions, and excitation functions, a level scheme of ^{69}As is proposed. The following mean lives (in the parentheses) have been determined by the recoil distance Doppler shift method: in ^{72}Se with level energies in keV, 862 (5.2 +- 0.5 ps); 1634 (2.7 +- 0.3 ps); 2466 (2.2 +- 0.3 ps); 3770 (9 +- 3 ps); in ^{69}As, 1307 (1.95 +- 0.05 ns); 2161 (5.1 +- 0.8 ps); 5198 (11.3 +- 1.5 ps). It is suggested that the positive parity states in ^{69}As form a rotational aligned g/sub 9/2/ proton band with $\gamma \cong 30^0$. The presumed 25/2$^+$ intruder state features the same deformation as deduced from he 13/2$^+$ → 9/2$^+$ B (E2) value.

45727 Angular distribution measurements for radiative capture of fast neutrons by ^{40}Ca. Weller, H.R.; Blue, R.A.; Von Behren, P.L.; Roberson, N.R.; Gould, C.R.; Tilley, D.R.; Wender, S.A. (University of Florida, Gainesville, Florida 32611). *Phys. Rev., C;* **17**: No. 3, 1260-1262(Mar 1978).

Angular distributions have been measured for neutron energies of 8 and 12 MeV for the ^{40}Ca(n,γ_0)^{41}Ca reaction. The extracted a_2 coefficients are in good agreement with recent direct-semidirect calculations. The behavior of a_2 is examined in light of recent results from polarized proton capture measurements on /sup 54,56,58/Fe.

NUCLEAR PROPERTIES AND REACTIONS, A=59-89, THEORETICAL

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45711, 45717

45728 Effect of breakup on the spin dependence of the deuteron-nucleus interaction. Rawitscher, G.H.; Mukherjee, S.N. (Physics Department, University of Connecticut, Storrs, Connecticut 06268). *Phys. Rev. Lett.;* **40**: No. 23, 1486-1489(5 Jun 1978).

Realistic breakup states with spin, based on Reid's nucleon-nucleon potential, are used to calculate the correction to elastic deuteron-nucleus scattering matrix elements S, to second order in the distorted-wave Born approximation. There are no free parameters. The breakup corrections move the values of S obtained with a simple folding model towards those obtained by Goddard and Haeberli in optical-model fit to observed elastic cross-section and polarization data.

NUCLEAR PROPERTIES AND REACTIONS, A=59-89, EXPERIMENTAL

RADIOACTIVE DECAY

45729 Mass and β decay of the new neutron-rich isotope ^{60}Mn. Norman, E.B.; Davids, C.N.; Murphy, M.J.; Pardo, R.C. (Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 6, 2176-2184(Jun 1978).

The new isotope ^{60}Mn was produced by bombarding ^{48}Ca with ^{18}O ions at E18/sub O/ = 50—70 MeV. The β-decay scheme of ^{60}Mn was determined from γ-ray singles and γ-γ coincidence experiments using large Ge(Li) detectors. The half life of ^{60}Mn was found to be 1.79 +- 0.10 s. A new level with excitation energy 2793 keV was observed in the daughter, ^{60}Fe. The ground-state spin and parity of ^{60}Mn was determined to be 3$^+$ and its total decay energy Q/sub β/ was measured to be 8.51 +- 0.10 MeV. This corresponds to a mass excess of - 52.89 +- 0.10 MeV, which is compared with various predictions. The structure of ^{60}Fe as determined from the present work and from previous experiments is compared with a shell-model calculation.

45730 Multiparticle configurations in the odd-neutron nuclei ^{61}Ni and ^{67}Zn populated by decay of ^{61}Cu, ^{67}Cu, and ^{67}Ga. Meyer, R.A.; Prindle, A.L.; Myers, W.A.; Hopke, P.K.; Dieterly, D.; Koops, J.E. (Lawrence Livermore Laboratory, University of Cali-

fornia, Livermore, California 94550). *Phys. Rev., C;* **17**: No. 5, 1822-1831(May 1978).

The decay of ^{61}Cu to levels of ^{61}Ni and the decay of ^{67}Cu and ^{67}Ga levels of ^{67}Zn have been studied in detail. The half-life of ^{67}Ga is measured to be 3.261 +- 0.001 days. Also, absolute intensities are reported for the γ rays from the decay of ^{67}Ga. Transition probabilities are calculated for ^{61}Ni using a shell model and a modified surface δ interaction.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45729

45731 Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei. Holland, R.E.; Lynch, F.J.; Belt, B.D. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 6, 2076-2079(Jun 1978).

A number of inhibited electric-quadrupole transitions have been found in odd-N nuclei, and their lifetimes have been measured. The pairing-plus-quadrupole model predicts a correlation between these lifetimes and the shell-model occupation numbers which can be obtained from pickup and stripping reactions. The correlation observed is about that expected from the accuracy of the data on occupation numbers.

45732 Mass and low-lying levels of ^{67}Ge; trends in the structure of /sup 63,65/Ni, /sup 65,67/Zn, and /sup 67,69/Ge. Murphy, M.J. ; Davids, C.N.; Norman, E.B. ; Pardo, R.C. (Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 5, 1574-1582(May 1978).

^{67}32Ge35 has been studied via the reaction ^{64}Zn(α,nγ)^{67}Ge. The mass excess was measured to be -62666 +- 12 keV, and four low-lying excited states have been identified. Among these newly identified levels is an isomeric state at 18.2 keV having a measured total mean lifetime of 18.5 +- 0.3 μs and a measured K-shell internal conversion coefficient α/sub K/ = 176 +- 29. In addition, the total lifetime of the 63.4 keV isomeric level in ^{65}Ni has been measured to be 104.9 +- 7.1 μs. The level schemes of the six nuclei /sup 63,66/ Ni, /sup 65,67/Zn, and /sup 67,69/Ge are then compared, and similarities in their structure and in the decay characteristics of the isomeric states of each are discussed and interpreted in terms of a simple pairing model.

NUCLEAR REACTIONS AND SCATTERING

45733 Spallation of copper by 80-GeV ^{40}Ar Ions. Cumming, J.B.; Haustein, P.E.; Ruth, T.J.; Virtes, G.J. (Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., C;* **17**: No. 5, 1632-1641(May 1978).

Cross sections for the production of 35 radioactive nuclides extending from ^{7}Be to ^{67}Ga by the interaction of 80-GeV ^{40}Ar ions with Cu have been measured. These are compared with existing results for other relativistic heavy ions and for 28-GeV protons incident on Cu targets of various thicknesses. Differences in shapes of the yield distributions for products with 37 < or = A < or = 64 are inferred to arise primarily from increased secondary effects in the semithick targets used for the heavy-ion studies. The larger absolute cross sections (corrected to zero target thickness) for ^{40}Ar ions appear to be due solely to the increased total reaction cross section, σ/sub R/, over that for protons. The production of target fragments with 22 < or = A < or = 64 is estimated to account for $\approx$ 70% of σ/sub R/. Calculations using realistic nuclear density distributions suggest that such products are formed in peripheral collisions (impact parameters > or $\approx$ 5 fm) in which there is no strong overlap of the cores of the ^{40}Ar and Cu nuclei. Lighter products are presumed to result from more central collisions, and these are enhanced by factors larger than expected from σ/sub R/ (a factor of 2 greater in the case of ^{7}Be). The application of the concepts of limiting fragmentation and factorization as a framework for the interpretation of high-energy heavy-ion induced reactions with complex nuclei is discussed.

45734 Elastic and deeply inelastic reactions in the ^{86}Kr + ^{139}La system at 505, 610, and 710 MeV. Vandenbosch, R.; Webb, M.P.; Dyer, P.; Puigh, R.J.; Weisfield, R.; Thomas, T.D.; Zisman, M.S. (Nuclear Physics Laboratory, University of Washington, Seattle, Washington 98195). *Phys. Rev., C;* **17**: No. 5, 1672-1681(May 1978).

Angular and energy distributions were measured for the reaction products from the ^{86}Kr + ^{139}La reaction at 505, 610, and 710 MeV bombarding energies. The elastic scattering data were analyzed to extract information about the conservative potential. The strength of the potential for separations close to the strong absorption radius is in agreement with a number of theoretical potentials including the proximity potential. Contour plots of the cross section for nonelastic reaction products as a function of angle and exit channel total kinetic energy for the 505 and 610 MeV bombardments exhibit two branches, similar to the behavior previously observed at 710 MeV. These results reveal no sharp energy dependence of the character of the deflection function, implying that the Z_1Z_2 product of the target and projectile system is more important than the bombarding energy in determining the orbits of the reacting nuclei. Upper limits to the fusion cross sections at all energies are less than 25% of the total reaction cross section. Calculations of the energy loss expected on the basis of a one-body proximity friction arising from particle exchange give an energy loss which is less than one-half of the observed energy loss.

45735 Electroexcitation of giant multiple resonances in ^{64}Zn and ^{124}Sn nuclei. Nemashkalo, A.A.; Afanas'ev, N.G.; Vladimirov, Y.V.; Likhachev, V.P.; Savitskii, G.A.; Khvastunov, V.M. *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 422-426(5 Oct 1977).

Results are presented of the investigation of giant multiple resonances in the nuclei ^{64}Zn and ^{124}Sn with the aid of inelastic scattering of electrons, performed in Khar'kov with the LUE-300 linear electron accelerator.

45736 Scattering of high energy electrons by ^{65}Cu. Polishchuk, V.N.; Shevchenko, N.G.; Afanas'ev, N.G.; Khomich, A.A.; Chkalov, I.I.; Litvinenko, A.S. (Physico-technical Institute, Ukrainian Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 9-11(Jul 1977).

We report the results of an experimental study of low-lying states in ^{65}Cu by the method of inelastic scattering of electrons with energy E_0=120 MeV in the region of momentum transfer to the nucleus q'=0.78—1.15F^{-}1. Values are obtained for the reduced transition probability B (Eλ) up-arrow from the ground state of the nucleus to excited states with ω=0.77, 1.11, 1.48, 2.62, 3.16, 3.52 3.85, and 4.26 MeV.

NUCLEAR PROPERTIES AND REACTIONS, A=90-149, THEORETICAL

MASS, ABUNDANCE, AND BINDING ENERGY

REFER ALSO TO CITATION(S) 45691

RADIOACTIVE DECAY

45737 Unified description of odd-mass indium nuclei I. General theory and comparison to ^{113}In and ^{115}In levels populated in the decay of ^{113}Sn and ^{115}Cd/sup m/,g. Heyde, K.; Waroquier, M.; Meyer, R.A. (Laboratorium voor Kernfysika, Proeftuinstraat 86, B-9000 Gent, Belgium). *Phys. Rev., C;* **17**: No. 3, 1219-1243(Mar 1978).

We describe the rich variety of nuclear phenomena in the odd-mass indium isotopes by taking into account the coupling of both single-hole and one-particle two-hole configurations (seniority v = 1 and v = 3) with the quadrupole and octupole vibrations of the underlying core (Sn) nucleus. To fully test the calculations, we have performed detailed spectroscopic studies of the ^{113}Sn, ^{115}Cd/sup m/, and ^{115}Cd/sup g/ decays. Energy spectra, spectroscopic factors for stripping and pickup reactions, and electromagnetic properties are calculated and compared with the experimental results for ^{115}In. We compare our model with earlier calculations for the odd-mass In isotopes and with band-mixing calculations using a deformed basis (Nilsson model) for all odd-mass In isotopes (107 < or = A < or = 119). The equivalence of the unified-model description with a rotational interpretation is discussed in some detail.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45737

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45808

45738 Statistical-model analyses of heavy-ion-induced fusion reaction products. Beckerman, M.; Blann, M. (Department of Chemistry and Nuclear Structure Research Laboratory, University of Rochester, Rochester, New York 14627). *Phys. Rev., C;* **17**: No. 5, 1615-1631(May 1978).

Results are presented of statistical/rotating liquid drop model ayalyses of fusion reaction products produced by heavy-ion reactions of medium mass target nuclei. Statistical fission parameters a/sub f//a/sub v/ and B/sub f/ are deduced from analyses of fission and evaporation residue excitation functions. The validity of approximations often made in fusion reaction product analyses regarding the treatment of multiple-change fission and of angular momentum coupling is examined. Predicted limits of survivial of multiple-chance fission competition by evaporation residues in reactions at high bombarding energies are compared with experimental results. The experimental limits of evaporation residue survival are found to

be adequately reproduced by the statistical/rotating liquid drop model using the statistical fission parametts deduced from the excitation function analyses. Using these parameters, calculations are performed of evaporation residue angyular momentum distributions and their moments. The influence upon these distributions of fission competition, particle emission, and the moment of inertia (yrast slope) is illustrated, and calculated results are compared with those inferred from γ-ray multiplicity measurements. The statistical fission parameters required to reproduce the fission and evaporation residue excitation functions are given a/sub f//a/sub ν/ = 1.00 to 1.04 and B/sub f/ = 0.51 to 0.65. The expected existence of thermal and deformation effects, as well as other reaction processes which could affect the parameters, it discussed. Since these aspect have not been incorporated that the formulation of the present model, it is emphasized that the deduced a/sub f//a/sub ν/ and B/sub f/ values should be regarded as effective statistical fission parameters.

NUCLEAR PROPERTIES AND REACTIONS, A=90-149, EXPERIMENTAL

RADIOACTIVE DECAY

REFER ALSO TO CITATION(S) 45737

45739 Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{122}Ag. Shih, L.L.; Hill, J.C.; Williams, S.A. (Ames Laboratory-USDOE and Department of Physics, Iowa State University, Ames, Iowa 50011). *Phys. Rev., C;* **17**: No. 3, 1163-1167(Mar 1978).

The decay of mass-separated ^{122}Ag to levels in ^{122}Cd has been studied. The half-life was measured to be 0.48 +- 0.08 sec in disagreement with earlier work. Of six γ rays observed, five were placed in a ^{122}Cd level scheme with excited states at 569, 1329, 1368, and 1979 keV. The results are compared with the systematics of other even-even Cd nuclei and predictions from a rotation-vibration model.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45739

45740 Optimum Q value in heavy-ion-induced neutron transfer at the Coulomb barrier. Henning, W.; Eisen, Y.; Koerner, H.; Kovar, D.G.; Schiffer, J.P.; Vigdor, S.; Zeidman, B. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 6, 2245-2247(Jun 1978).

The optimum Q value for the ^{118}Sn(^{18}O, ^{16}O)^{120}Sn two-neutron transfer reaction was measured near the Coulomb barrier as a function of incident energy and scattering angle. The experimental results are not reproduced in a satisfactory manner by semiclassical predictions, and only approximately by distorted-wave Born approximation.

45741 Half-life of ^{92}Nb/sup g/. Nethaway, D.R.; Prindle, A.L.; Van Konynenburg, R.A. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Rev., C;* **17**: No. 4, 1409-1413(Apr 1978).

We have produced the long-lived ground state of ^{92}Nb by irradiation of niobium foils with 14.8-MeV neutrons, and we have established its half-life from measurements of the disintegration rate and the neutron fluence together with the known ^{93}Nb(n,2n)^{92}Nb/sup g/ cross section. On the basis of two separate experiments we obtain t/sub 1/2/(^{92}Nb/sup g/) = (3.6 +- 0.3) x 10^7 yr.

45742 States of ^{122}In and ^{124}In. Ajzenberg-Selove, F.; Flynn, E.R.; Sunier, J.W.; Hanson, D.L. (Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania 19174). *Phys. Rev., C;* **17**: No. 3, 960-963(Mar 1978).

The (t,^{3}He) reactions of ^{122}Sn and ^{124}Sn have been used to study the masses and the low-lying excited states of ^{122}In and ^{124}In. The ground state Q-values as measured here for these two reactions are -6350(50) and -7590(50) keV, respectively, leading to masses of 121.91028(5) and 123.91344(5) u for ^{122}In and ^{124}In. Fourteen excited states of ^{122}In with E/sub x/ < 1.2 MeV and four excited states of ^{124}In with E/sub x/ < 0.6 MeV are also reported. Comparisons are made with β-decay data.

45743 Quasi-ground, quasi-beta, and quasi-gamma bands. Sakai, M.; Rester, A.C. (Institute for Nuclear Study, University of Tokyo, Tokyo, Japan). *At. Data Nucl. Data Tables;* **20**: No. 5, 441-474(Nov 1977).

For even-even nuclei a list is presented of the probable members of quasi-ground, quasi-beta, and quasi-gamma bands of the spherical regions and the corresponding ground, beta, and gamma bands of the deformed regions. For simplicity the term "quasi" is used for both regions. References are given to the experimental data basic to the level assignments. The literature has been covered through November 1976.

45744 Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag. Mihu, R.; Aleksandrov, Y.A.; Aprelev, M.V.; Zarubin, P.P. (Leningrad State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 1-3(Jul 1977).

The γ radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag has been studied. To exclude impurity γ rays we investigated also the γ radiation from the reaction ^{106}Pd(p,nγ)^{106}Ag. The γ-ray measurements were made with a Ge(Li) spectrometer with a sensitive volume of 30 cm^3 and an energy resolution of 2.8 KeV for a γ-ray energy 1.3 MeV. As a result of the measurements we have improved the level scheme of ^{105}Ag and the γ transitions between levels.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45702, 45707, 45715, 45742

45745 Gamma-ray multiplicity moments from deeply inelastic collisions of ^{86}Kr and ^{144}Sm. Christensen, P.R.; Folkmann, F.; Hansen, O.; Nathan, O.; Trautner, N.; Videlbaek, F.; Werf, S.Y.v.d.; Britt, H.C.; Chestnut, R.P.; Freiesleben, H.; Puehlhofer, F. (Niels Bohr Institute, University of Copenhagen, DK-2100 Copenhagen O, Denmark). *Phys. Rev. Lett.;* **40**: No. 19, 1245-1248(8 May 1978).

First, second, and third moments of gamma-ray multiplicity distributions from deeply inelastic collisions have been measured for the system ^{86}Kr on ^{144}Sm at 490-MeV Kr energy. The average gamma-ray multiplicities are ≃ 21, independent of reaction angle and fragment charge. The multiplicity distributions are broad, with standard deviations of ν ≃ 10, and they have a negative skewness.

45746 Measurement of the energy division versus mass in highly damped reactions. Plasil, F.; Ferguson, R.L.; Britt, H.C.; Stokes, R.H.; Erkkila, B.H.; Goldstone, P.D.; Blann, M.; Gutbrod, H.H. (Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev. Lett.;* **40**: No. 18, 1164-1166(1 May 1978).

Nuclear charge, mass, and kinetic energies were measured in fragments from the reactions of ^{86}Kr + ^{124}Sn at 440- and 720-MeV bombarding energies. From these data it was deduced that the internal excitation energy of the strongly damped products divides proportionally with the mass.

NUCLEAR PROPERTIES AND REACTIONS, A=150-189, EXPERIMENTAL

REFER ALSO TO CITATION(S) 45738

ENERGY LEVELS AND TRANSITIONS

45747 Levels in ^{189}Ir and ^{191}Ir observed in the (p,t) reaction. Struble, G.L.; Lanier, R.G.; Mann, L.G.; Sheline, R.K.; Kouzes, R.T.; Moore, W.H.; Mueller, D.; Naumann, R.A.; Oelrich, I.C. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). *Phys. Rev., C;* **17**: No. 5, 1564-1573(May 1978).

Levels in ^{189}Ir and ^{191}Ir were populated by the (p, t) reaction, using 34-MeV protons and isotopically enriched ^{191}Ir and ^{193}Ir targets. A number of low-lying positive-parity bands were observed. In addition the 11/2$^-$ [505] bandhead was also weakly populated. The 3/2 1/2$^+$ [400] states in ^{189}Ir and ^{191}Ir have similar but anomalous angular distributions. Four strongly populated states with L = 0 angular distributions are observed from 719 to 1261 keV in ^{189}Ir. For the same energy region in ^{191}Ir, the L = 0 states are less strongly populated.

45748 Coulomb-nuclear interference for high-spin states excited by ^{86}Kr, ^{40}Ar, and ^{16}O projectiles. Guidry, M.W.; Butler, P.A.; Donangelo, R.; Grosse, E.; Masri, Y.E.; Lee, I.Y.; Stephens, F.S.; Diamond, R.M.; Riedinger, L.L.; Bingham, C.R.; Kahler, A.C.; Vrba, J.A.; Robinson, E.L.; Johnson, N.R. (Department of Physics, University of Tennessee, Knoxville, Tennessee 37916). *Phys. Rev. Lett.;* **40**: No. 15, 1016-1019(10 Apr 1978).

We report the experimental evidence for Coulomb-nuclear interference in the excitation of high-spin states by very heavy projectiles. The data are intepreted with use of a model described previously, and the feasibility of using this method to study the deformed nuclear surface is demonstrated.

45749 Multiple high-spin band structure in ^{164}Er. Kistner, O.C.; Sunyar, A.W.; der Mateosian, E. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., C;* **17**: No. 4, 1417-1427(Apr 1978).

^{164}Er high spin states were studied via the ^{160}Gd(^{9}Be,5n) reaction at 59-MeV beam energy. We find significant population of

three new rotational bands in addition to higher spin levels of the previously known γ-vibrational band. In most cases the spins of the levels were established by angular distribution measurements, and some parities were established by linear polarization measurements on interband transitions. Two odd-parity bands with both even- and odd-spin states begin with the previously reported 5^- (1664 keV) and 7^- (1985 keV) levels and extend to levels of spin 22 (5350 keV) and 13 (3351 keV), respectively. These two bands exhibit markedly different moments of inertia. The third band is of unknown parity and has a likely even-spin sequence extending from a level of spin 8 (2091 keV) to a possible spin-22 level (5678 keV). The even-spin sequence of the γ band extends to a spin-14 level (3267 keV) and exhibits a backbend at the 10^+ level to a new $12^{+\prime}$ level of the previously established even-spin even-parity yrast band. The odd-spin sequence backbends at spin 13, and extends to a possible spin-19 level at 4588 keV, thereby providing evidence for an odd-spin even-parity yrast band some 500 keV higher in energy than its even-spin counterpart.

45750 Recoil-distance measurement of lifetimes of rotational states in ^{164}Dy. Sayer, R.O.; Eichler, E.; Singhal, N.C.; Sturm, R.; Johnson, N.R.; Guidry, M.W. (Computer Sciences Division, Oak Ridge National Laboratory, Union Carbide Corporation-Nuclear Division, Oak Ridge, Tennessee 37830). *Phys. Rev., C;* **17**: No. 3, 1026-1033(Mar 1978).

Lifetimes of the 4^+ to 12^+ levels in the ground state rotational band of ^{164}Dy have been measured by means of the Doppler-shift recoil-distance technique. Our best values for the mean lives of the 4^+—12^+ states are 286 +- 15, 39.0 +- 1.9, 10.4 +- 0.7, 3.7 +- 0.8, and 1.6 +- 0.8 ps, respectively. The corresponding B (E2) values exhibit a spin dependence consistent with rigid-rotor predictions. Within the respective experimental uncertainties, previous results obtained by multiple Coulomb excitation and Doppler-broadened line shape methods are in agreement with the present recoil-distance values.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45748

45751 Energy and spin dependence of fission: ^{1}H and ^{4}He emission from ^{194}Hg compound nuclei. Miller, J.M.; Logan, D.; Catchen, G.L.; Rajagopalan, M.; Alexander, J.M.; Kaplan, M.; Ball, J.W.; Zisman, M.S.; Kowalski, L. (Department of Chemistry, Columbia University, New York, New York 10027). *Phys. Rev. Lett.;* **40**: No. 16, 1074-1077(17 Apr 1978).

Reactions of ^{12}C and ^{19}F have been used to produce ^{194}Hg compound nuclei at excitation energies of 98 and 142 MeV. This combination of entrance channels permits the separation of energy and spin effects on the exit channels. Fission probability clearly increases with angular momentum at fixed energy. However, there is no increase in the cumulative fission fraction from 98 to 142 MeV for essentially constant spin domain. In contrast the probabilty of ^{1}H and ^{4}He evaporation increases rapidly with energy and seems to shield the system from fission.

45752 Parameters of terbium neutron resonances. Popov, A.B.; Faikov, K.; Gou, H.C. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 6-8(Jul 1977).

In the neutron spectrometer of the Laboratory of Nuclear Physics at our Institute with a resolution from 11 to 3.5 nsec/m we have measured the yield of γ rays from neutron capture and the transmission for several samples of ^{159}Tb. The parameters have been determined for neutron resonances in the region up to 580 eV. The average distance between resonances is found to D=4.4 +- 0.4 eV and the strength function to be $S^0 = (1.25 \pm 0.18) \times 10^{-4}$.

NUCLEAR PROPERTIES AND REACTIONS, A=190-219, EXPERIMENTAL

RADIOACTIVE DECAY

REFER ALSO TO CITATION(S) 45756

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45747

45753 States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions. Yamazaki, Y.; Sheline, R.K.; Shera, E.B. (Florida State University, Tallahassee, Florida 32306). *Phys. Rev., C;* **17**: No. 6, 2061-2070(Jun 1978).

States in ^{197}Pt have been studied using the ^{196}Pt(d,p)^{197}Pt and ^{198}Pt(d,t)^{197}Pt reactions with 13.5 MeV deuterons and the ^{196}Pt(n,γ) reaction using thermal neutrons. The measured Q values were 3.606 +- 0.020, - 1.221 +- 0.020, and 5846.3 +- 0.0004 MeV for the (d,p), (d,t), and (n,γ) reactions, respectively. Transferred l values have been determined from angular distributions and spectroscopic factors determined by comparison with distorted-wave Born-approximation calculations. Some of the states can be tentatively assigned as Nilsson states arising from an oblate deformation. These include the $5/2^-$ [532], decoupled $1/2^+$ [600] and $9/2^+$ [615] states. A number of low lying states with l = 1 cannot be explained using the Nilsson model or the shell model.

45754 Observation of primary E2 transitions in the reaction ^{207}Pb(n, γ). Raman, S.; Mizumoto, M.; Slaughter, G.G.; Macklin, R.L. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev. Lett.;* **40**: No. 20, 1306-1309(15 May 1978).

Thirty-six high-energy, primary E2 transitions to the ^{208}Pb ground state have been identified and their radiation widths measured in a study of the reaction ^{207}Pb(n,γ). The measured E2 widths in the excitation energy region between 7.37 and 8.17 MeV are compared with those expected from the rising tails of giant quadrupole resonances located at 8.9 and 10.9 MeV.

45755 ^{192}Pt(α,α′) reaction at E = 24 MeV. Todd Baker, F.; Scott, A.; Ronningen, R.M.; Kruse, T.H.; Suchannek, R.; Savin, W. (Department of Physics, University of Georgia Athens, Georgia 30602). *Phys. Rev., C;* **17**: No. 5, 1559-1563(May 1978).

Angular distributions for excitation of the 0^+, 2^+, $2^{+\prime}$, 4^+, $4^{+\prime}$, and 3^- states in ^{192}Pt by 24 MeV α particles have been measured. Coupled-channels analysis of the ground-state band yields negative β_4 deformations. Analysis of the "γ band" yields a negative E2 interference term P_3 and a surprising large direct E4 excitation of the $4^{+\prime}$ state.

45756 Nuclear Data Sheets for A=199. Halperin, J. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Nucl. Data Sheets;* **24**: No. 1, 57-116(May 1978).

Nuclear structure data including detailed level schemes for mass chain A=199 have been compiled and evaluated. Level properties obtained from various reaction and decay experiments have been summarized in tabulations and in drawings. Inconsistencies and discrepancies have been noted, and adopted values for level properties are given. All nuclear structure data available to October 1977 have been included.

45757 Nuclear data sheets for A=203. Schmorak, M.R. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Nucl. Data Sheets;* **24**: No. 1, 117-173(May 1978).

Experimental data pertaining to nuclei with A=203 are compiled and evaluated.

45758 Observation of 12^- magnetic spin states in ^{208}Pb. Lichtenstadt, J.; Heisenberg, J.; Papanicolas, C.N.; Sargent, C.P.; Courtemanche, A.N.; McCarthy, J.S. (Bates Linear Accelerator Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev. Lett.;* **40**: No. 17, 1127-1130(24 Apr 1978).

States at 6.42-, 6.75-, and 706-MeV excitation have been observed in electron scattering on ^{208}Pb. The transverse character of the excitation cross sections has been established. The states have been interpreted as the v (i/sub 13/2/$^-$ 1j/sub 15/2/)/sub 12hyphen/ ,/sup 14hyphen/ and the π (h/sub 11/2/$^-$ 1i/sub 13/2/)/sub 12hyphen/ single-particle hole excitations of the ^{208}Pb ground state, on the basis of the measured momentum-transfer dependence and the magnitude of the cross section.

MOMENTS AND SPIN

REFER ALSO TO CITATION(S) 45712, 45758

NUCLEAR REACTIONS AND SCATTERING

45759 Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets. Otto, R.J.; Seaborg, G.T.; Fowler, M.M. (Lawrence Berkeley Laboratory and Department of Chemistry, University of California, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 3, 1071-1085(Mar 1978).

Recoil range distributions have been measured for the elements between lutetium (Z = 71) and astatine (Z = 85) produced in heavy ion reactions of 420, 491 and 581 MeV ^{86}Kr with ^{197}Au, 686 MeV ^{86}Kr with ^{238}U, and 868 MeV ^{136}Xe with ^{197}Au; the relative yields were established by used of x-ray spectrometry. These elements have been identified in radioanalytical mass distribution studies and kinematic studies as deep inelastic and quasielastic transfer reaction products. For the uranium target reactions they form the mass distribution colloquially referred to as the "gold finger." The measured recoil rnge distributions for the gold target reactions are correlated with energy and angular distribution measurements made on the projectilelike fragments formed in deep inelastic reactions.

SPONTANEOUS AND INDUCED FISSION

45760 Evidence for angular momentum depolarization and for enhanced sequential fission in the reaction ^{197}Au(^{86}Kr, Z$_0$f). Wozniak, G.J.; Schmitt, R.P.; Glaessel, P.; Jared, R.C.; Bizard, G.; Moretto, L.G. (Nuclear Science Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Phys. Rev. Lett.;* **40**: No. 22, 1436-1439(29 May 1978).

At 618 MeV bombarding energy, large fission probabilities have been observed for recoil fragments heavier than the target. The probability of sequential fission seems to depend very strongly upon angular momentum as well as upon excitation energy. The out-of-plane widths of the fission fragments together with the above observation imply that a nearly random depolarization of the heavy-fragment angular momentum may occur during the deep-inelastic processes.

NUCLEAR PROPERTIES AND REACTIONS, A=220 AND ABOVE, THEORETICAL

MASS, ABUNDANCE, AND BINDING ENERGY

45761 Presence of π^- mesons in heavy atomic nuclei. Grigoryan, L.S.; Saakyan, G.S. (Erevan State University). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 11, 653-655(Nov 1977).

The Weizsacker formula along with experimental data on the binding energies of heavy nuclei is used to confirm the presence of π^- mesons in these nuclei.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45808

45762 Relativistic two-fluid model of nucleus-nucleus collisions. Amsden, A.A.; Goldhaber, A.S.; Harlow, F.H.; Rayford Nix, J. (Theoretical Division, Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Rev., C;* **17**: No. 6, 2080-2096(Jun 1978).

To take into account the expected partial transparency of nuclei during collisions at high energy, we introduce a two-fluid dynamical model, in which coupled relativistic equations of motion are solved for separate target and projectile nuclear fluids. At low relative velocities the target and projectile fluids merge, in which case the conventional one-fluid dynamical model is recovered. For given nuclear equation of state and initial conditions, the equations of motion are solved as functions of time for the nucleon number density, momentum density, energy density, pressure, and velocity for each fluid. In spatial dimensions by means of a relativistic generalization of a standard particle-in-cell finite-difference computing method for multiphase fluid-dynamics problems. For each of several impact parameters, the velocity distribution at some large time is converted to an energy and angular distribution for the expanding matter. Integration of these results over impact parameter then gives $d^2\sigma/dEd\Omega$. For ^{20}Ne + ^{238}U at laboratory bombarding energies per nucleon of 250 MeV, 400 MeV, and 2.1 GeV, as well as for ^{4}He + ^{238}U at a laboratory bombarding energy per nucleon of 400 MeV, we compare calculated and experimental energy spectra for outgoing charged particles at several angles. The calculations reproduce correctly the experimental slopes at each angle, as well as the overall decrease in the experimental cross section when going from forward to backward angles. However, for ^{20}Ne + ^{238}U at laboratory bombarding energies per nucleon of 250 and 400 MeV, the calculated values at 30^0 are only one-third the experimental values. Also, for ^{4}He + ^{238}U at a laboratory bombarding energy per nucleon of 400 MeV, the calculated values at all angles are substantially smaller than the experimental values. We deduce results for ^{238}U + ^{238}U at laboratory bombarding energies per nucleon of 250 MeV and 2.1 GeV.

SPONTANEOUS AND INDUCED FISSION

45763 Fission-evaporation competition in Pu isotopes of mass 235—239. Delagrange, H.; Fleury, A.; Alexander, J.M. (Centre d'Etudes Nucleaires de Bordeaux-Gradignan, Laboratoire de Chimie Nucleaire ERA N^0 144, Le Haut Vigneau, 33170 Gradignan, France). *Phys. Rev., C;* **17**: No. 5, 1706-1720(May 1978).

Cross sections are reported for the reactions /sup 233,234,235/U(^{4}He, xn), for x = 1—4. Comparisons are shown to calculations based on equilibrium and preequilibrium models. Fits of preequilibrium-model calculations to the tails of the excitation functions require significantly different parameters from those in the literature for other systems. There is a suggestion for emission of a second preequilibrium neutron. The equilibrium-model calculations show systematic deviations from the data that can be related to the empirically determined energy dependence of Γ/sub n//(Γ/sub n/ + Γ/sub f/). The fission barrier parameters for isotopes of Pu are refined. Their relationship to the excitation functions for ground state and shape isomeric nuclei is discussed.

45764 Statistical-model analysis of fission isomer production for /sup 237,235/Pu and ^{2}39Am. Fleury, A.; Delagrange, H.; Alexander, J.M. (Centre d'Etudes Nucleaires de Bordeaux-Gradignan, Laboratoire de Chimie Nucleaires ERA No. 144, Le Haut Vigneau, 33170 Gradignan, France). *Phys. Rev., C;* **17**: No. 5, 1721-1730(May 1978).

The statistical-model description of fission isomer production is reexamined. Level densities are used which include the conditions of symmetry and collective enhancements. Barrier parameters are constrained to be consistent with cross sections from (^{4}He,xn) and direct reactions. Calculated isomer cross sections are very sensitive to the model parameters in specific ways that vary with incident energy and with the relative barrier heights and thicknesses. Consideration of the ratio of isomer-to-ground-state cross sections focuses the sensitivity on the properties of the final product nucleus. For the three cases with best known isomer ratios we reexamine the isomer threshold and the fission barriers.

45765 Dynamics of induced fission. Negele, J.W.; Koonin, S.E.; Moeller, P.; Nix, J.R.; Sierk, A.J. (Center for Theoretical Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev., C;* **17**: No. 3, 1098-1115(Mar 1978).

Induced fission of ^{2}36U is calculated in the time-dependent mean-field approximation assuming axial and reflection symmetry and omitting the spin-orbit interaction. Constrained static solutions are used to generate the appropriate initial condition and are compared in detail with results of macroscopic-microscopic calculations. Although dynamic mean-field results are strongly dependent upon an effective pairing gap, predicted observables are consistent with experiment for plausible values of the gap. Detailed comparisons with macroscopic models indicate that both a modified one-body dissipation and two-body viscosity yield observables similar to those of the mean-field theory, even though these physical dissipation mechanisms are fundamentally different.

NUCLEAR PROPERTIES AND REACTIONS, A=220 AND ABOVE, EXPERIMENTAL

MASS, ABUNDANCE, AND BINDING ENERGY

45766 Nuclear charge distributions deduced from the muonic atoms of ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu. Close, D.A.; Malanify, J.J.; Davidson, J.P. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev., C;* **17**: No. 4, 1433-1455(Apr 1978).

The muonic x rays from four highly deformed actinide nuclei ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu have been measured. A four parameter Fermi charge distribution with distortion terms of the form β/sub 2n/Y/sub 2n/0, n < or = 2, was used to characterize the nuclear charge distribution. A least squares fit was made to the energies of the 2p-1s and 3d-2p muonic x rays and their fine and hyperfine structure splitting. The 4f-3d and 5g-4f muonic x rays were measured for the four nuclei as well as the 5-3, 4-2, and 3-1 muonic transitions for ^{2}32Th and ^{2}38U. The intrinsic electric quadrupole moments were deduced. Our results are compared with those from earlier muonic experiments, as well as with proton, α, and electron inelastic scattering.

RADIOACTIVE DECAY

45767 Proton states in the Z = 99 nucleus ^{251}Es excited by ^{251}Fm electron capture decay and ^{250}Cf(α,t) reaction. Ahmad, I.; Sjoblom, R.K.; Friedman, A.M.; Yates, S.W. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 6, 2163-2175(Jun 1978).

Level structure of the Z = 99 nucleus, ^{251}Es, has been investigated by measuring the γ rays and conversion electrons associated with the electron capture decay of 5.3-h ^{251}Fm, and from triton spectra produced in the ^{250}Cf(α,t)^{251}Es reaction. The γ-ray spectra were measured with a 2-cm^2 x 5-mm planar and a 25-cm^3 coaxial Ge(Li) detector and the electron spectra were measured with a cooled Si(Li) detector. Forty-five γ rays were identified in ^{251}Es and the multipolarities of most of the transitions were deduced. Logft values for the observed electron capture transitions were derived from the measured electron capture transition intensities. A two-parameter γ-γ coincidence experiment was performed to determine the relationships between various γ transitions. Triton spectra from the ^{250}Cf(α,t)^{251}Es reaction were analyzed with an Enge split-pole magnetic spectrograph. On the basis of the present investigation the following intrinsic states were identified in ^{251}Es: 3/2 - [521], 0; 7/2 + [633], 8.3; 1/2 - [521], 411; 7/2 - [514], 461.4; 9/2 + [624], 777.9; {7/2 + [633] x 2 + }/sub 11/2+/ vibrational state, 889.1; {n[734]9/2 - ; n[620]1/2 + ; p[521]3/2 - }/sub 11/2+/ three-

quasiparticle state, 1239.0 keV. A Kπ = 11/2 + state at 1264.9 keV was interpreted as a three-quasiparticle state but could not be given a definite assignment. This is the first time a definite identification of the proton orbitals 1/2 -[521] and 7/2 - [514] has been made in any nucleus.

45768 Decay of ^{2}34Th to the ^{2}34Pa isomers. Chu, Y.Y.; Scharff-Goldhaber, G. (Departments of Chemistry and Physics, Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., C;* **17**: No. 4, 1507-1509(Apr 1978).

The low-energy portion of the photon spectrum for the β decay of ^{2}34Th has been investigated with a carefully calibrated Ge(Li) detection system because of the excessive photon intensity of the M1 73.7-keV transition reported previously. The new photon intensity obtained for this transition relative to other strong transitions is consistent with the most recent conversion electron measurements in the two-step ^{2}34Pa/sup m/ isomeric transition. The upper energy limit of the unobserved E3 isomeric transition is discussed in terms of total converion coefficients, hindrance factors, and the detection limit of the recent conversion electron measurements.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 45748, 45767

45769 Energy levels of ^{2}39U observed with the (d,p) reaction. Erskine, J.R. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 3, 934-938(Mar 1978).

Energy levels of ^{2}39U up to an excitation energy of 1.6 MeV have been studied with the ^{2}38U(d,p) ^{2}39U reaction at a bombarding energy of 12 MeV. Angular distributions $75^{0} < \text{or} = \theta/\text{sub L/} < 150^{0}$ provided information on the l values transferred. Level assignments based on the (d,p) data are suggested which partially corroborate recent studies of ^{2}39U with neutron-capture γ rays.

NUCLEAR REACTIONS AND SCATTERING

45770 Precise measurement of the capture width of the 6.67-eV neutron resonance of uranium-238. Staveloz, P. (Vrije Univ., Brussels); Poortmans, F.; Mewissen, L.; Cornelis, E. *Nucl. Sci. Eng.;* **66**: No. 3, 349-353(Jun 1978).

Neutron scattering cross-section measurements were performed with a very thin ^{238}U sample. From an area analysis of the data, a value of 24.2 +- 0.8 MeV was obtained for the capture width of the 6.67-eV resonance.

45771 Neutron capture cross-section ratios of ^{240}Pu, ^{242}Pu, ^{238}U, and ^{197}Au in the energy range from 10 to 90 keV. Wisshak, K.; Kaeppeler, F. (Kernforschungszentrum, Karlsruhe, Ger.). *Nucl. Sci. Eng.;* **66**: No. 3, 363-377(Jun 1978).

The neutron capture cross sections of ^{240}Pu and ^{242}Pu were measured in the energy range from 10 to 90 keV. The capture cross sections of both ^{197}Au and ^{238}U were chosen as standards. Neutrons were produced via the ^{7}Li(p,n) reaction with the Karlsruhe 3-MV pulsed Van de Graaff accelerator. Capture events were detected by a Moxon-Rae detector. The high neutron flux available at flight paths as short as approximately 10 cm offers a signal-to-background ratio one order of magnitude better than obtained in previous experiments. The cross section ratios could therefore be determined with a total statistical and systematic uncertainty of 4 to 10% for ^{240}Pu and 6 to 10% for ^{242}Pu. The results agree with previous data, while discrepancies to the evaluated files ENDF/B-IV and KEDAK 3 were found (up to 30% for ^{240}Pu and up to 50% for ^{242}Pu).

SPONTANEOUS AND INDUCED FISSION

45772 (ORNL/TM—6245) **Review and combination of experimental results for neutron emission per fission of ^{232}Th.** Gwin, R. (Oak Ridge National Lab., Tenn. (USA)). May 1978. Contract W-7405-ENG-26. 18p. Dep. NTIS, PC A02/MF A01.

An analysis was made of the existing experimental data for ν-bar(E) of ^{232}Th, the average number of neutrons emitted per fission of ^{232}Th. This analysis suggests that a single linear function of the neutron energy describes the data within their uncertainties. The parameters of the linear function and their uncertainties are given. 1 figure, 5 tables.

45773 (ORNL/TM—6246) **Measurements of the average number of prompt neutrons emitted per fission of ^{239}Pu and ^{235}U.** Gwin, R.; Spencer, R.R.; Ingle, R.W.; Todd, J.H.; Weaver, H. (Oak Ridge National Lab., Tenn. (USA)). May 1978. Contract W-7405-ENG-26. 28p. (ENDF—264). Dep. NTIS, PC A03/MF A01.

Measurements of the average number of prompt neutrons ν bar/sub p/(E) emitted in neutron-induced fission of ^{235}U and ^{239}Pu relative to ν bar/sub p/ for spontaneous fission of ^{252}Cf were made over an incident neutron energy range from 0.005 eV to 10 MeV. The incident neutrons were generated in pulses at the Oak Ridge Electron Linear Accelerator, and their energies, defined by time-of-flight methods. The samples were contained in fission chambers located in a large liquid scintillator. Fissions in the samples were identified by the simultaneous detection of prompt fission gamma rays in the scintillator and a pulse from the fission chamber. Fission neutrons were identified by the detection of the prompt gamma-ray cascade resulting from neutron absorption in gadolinium loaded in the liquid scintillator. The value of ν bar/sub p/(E) for ^{239}Pu at 0.0253 eV agrees with the value given in EDNF/B-IV, whereas the corresponding value for ^{235}U is about 0.7% larger than that given in ENDF/B-IV. 4 figures, 4 tables.

45774 General correlation for independent fission product yield uncertainties. Spinrad, B.I.; Wu, C.H. (Oregon State Univ., Corvallis). *Nucl. Sci. Eng.;* **66**: No. 3, 421-424(Jun 1978).

Measurements of independent fission product yields from thermal-neutron fission of ^{235}U, ^{239}Pu, ^{233}U, and ^{241}Pu were compared with expected yields from a semiempirical analytical model. A general correlation between the experimental/theoretical ratio and the distance of the nuclide from Z/sub p/, the most probable charge in a fission product mass chain, was constructed. This correlation can serve as a basis for assigning uncertainties to theoretical yield estimates.

45775 Measurements of the neutron-induced fission cross sections of ^{240}Pu, ^{242}Pu, and ^{244}Pu relative to ^{235}U from 0.1 to 30 MeV. Behrens, J.W.; Newbury, R.S.; Magana, J.W. (Univ. of California, Livermore). *Nucl. Sci. Eng.;* **66**: No. 3, 433-441(Jun 1978).

The fission cross-section ratios ^{240}Pu: ^{235}U, ^{242}Pu: ^{235}U, and ^{244}Pu: ^{235}U were measured as a function of neutron energy from 0.1 to 30 MeV using ionization fission chambers, the time-of-flight technique, and the threshold method at the Lawrence Livermore Laboratory 100-MeV electron linear accelerator. The measured cross-section ratios, averaged over the neutron energy interval from 1.75 to 4.00 MeV, are 1.366 +- 0.025, 1.110 +- 0.019, and 0.979 +- 0.020, respectively.

45776 Yet more complexity in fission: Barriers for nuclei with N = 150—154. Britt, H.C.; Gavron, A.; Goldstone, P.D.; Schoenmackers, R.; Weber, J.; Wilhelmy, J.B. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev. Lett.;* **40**: No. 15, 1010-1013(10 Apr 1978).

Fission probabilities are presented for a series of Pu, Cm, and Cf nuclei with neutron numbers, N, in the range of 150—154. Results show that the fission thresholds are slowly varying with N and Z for N = 150—153 but there is a strong decrease in the threshold for N = 154. For ^{2}52Cf(N = 154) the results indicate broad, strong resonances at ~ 5.0 and 5.4 MeV and suggest the breakup of the first axially asymmetric saddle into two barriers with large h ω.

45777 Fission product yields from 6—9 MeV neutron-induced fission of ^{2}35U and ^{2}38U. Chapman, T.C.; Anzelon, G.A.; Spitale, G.C.; Nethaway, D.R. (McClellan Central Laboratory, USAF, 1155th Technical Operations Squadron, McClellan AFB, California 95652). *Phys. Rev., C;* **17**: No. 3, 1089-1097(Mar 1978).

The yields of 28 mass chains have been measured for fission of ^{2}35U and ^{2}38U induced by neutrons at four different energies from 6.0 to 9.1 MeV. This is the first experimental measurement where sufficient energy resolution was obtained to observe the effect of the onset of second chance fission in the case of symmetric fission. The ^{1}11Ag and ^{1}12Pd results are compared with measurements at other neutron energies and with previous theoretical predictions. All nuclide results are presented in tabular form, as a function of neutron energy. The mass chains measured range from 84 to 156.

45778 Oklo natural nuclear reactor. Petrov, Y.V. (B. P. Konstantinov Institute of Nuclear Physics, USSR Academy of Sciences, Leningrad). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 11, 937-944(Nov 1977).

The discovery and implications of the natural nuclear reactor found at Oklo, Ghana are reviewed. The properties of the Oklo phenomenon are discussed in some detail, and the basis theory of chain reactions is presented.

NUCLEAR THEORY

NUCLEAR STRUCTURE

45779 Coordinate-space formalism of the random-phase approximation. Tsai, S. (School of Physics and Astronomy, University of Minnesota, Minneapolis, Minnesota 55455). *Phys. Rev., C;* **17**: No. 5, 1862-1870(May 1978).

Based on the conventional particle-hole representation of the random-phase-approximation eigenvalue equation, it is shown that the coordinate-space formalism can be derived directly and is valid generally for rotation and time-reversal invariant interactions. Ex-

plicit expressions are given for the interaction strengths and transformation coefficients in the case of Skyrme interactions.

45780 Extended time-dependent Hartree-Fock approximation with particle collisions. Wong, C.; Tang, H.H.K. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev. Lett.;* **40**: No. 16, 1070-1073(17 Apr 1978).

We formulate an extended time-dependent Hartree-Fock approximation which includes particle collisions. As the configuration-space analog of the quantum Boltzmann equation, it can be utilized to study the dynamics of nuclear or other fermion systems when irreversible dissipation is present.

45781 Electric and dynamic quadrupole moments of even-even nuclei. Goldhaber, A.S.; Scharff-Goldhaber, G. (Institute for Theoretical Physics, State University of New York, Stony Brook, New York 11794). *Phys. Rev., C;* **17**: No. 3, 1171-1178(Mar 1978).

For the ground-state bands of nonmagic even-even nuclei, the variable moment-of-inertia law defines an effective moment of inertia I (J), using only the energies of the 2^+ and 4^+ states. From the definition, I (J) is never negative. The "average" moment of inertia $I_0$2 equivalent 1/2[I (0(+ I (2)] may then be related to the transition quadrupole moment $Q_0$2. I (Q) is well described by a continuous function ranging over almost two orders of magnitude in both quantities. This function is linear for small values of Q ($<$ or $\approx$ 4 e b), quadratice for intermediate values (4 $<$ or $\approx$ Q $<$ or $\approx$ 11 d b), and essentially constant for larger values (11 $<$ or = Q $<$ or = 13 e b). The linear section pertains to all nuclei which deviate by not more than two pairs from being singly magic. In this group are both light deformed nuclei (e.g., ^{1}2C and ^{2}4Mg) and heavier spherical nuclei ranging from 30 $<$ or $\approx$ A $<$ or $\approx$ 200. The values of I and Q in this region are (within +- 50%) those that would be obtained if the nucleus were replaced by a dumbbell with length equal to the nuclear diameter and an α particle at either end. The quadratic relation has a simple interpretation in a picture of the nucleus as a droplet composed of two fluids, a superfluid which does not contribute to the angular momentum, and an inertial or rigidly rotating component which forms a fixed fraction f of the mass density at each point in the nucleus. The fraction f, computed according to a simple rule from the degree of deformation of the droplet, vanishes if the droplet is spherical. The constancy of I at the largest Q values (associated with spontaneously fissioning nuclei) may be due to a slight proton excess at the poles of the nucleus.

45782 Nuclear mass relations and equations. Monahan, J.E.; Serduke, F.J.D. (Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev., C;* **17**: No. 3, 1196-1204(Mar 1978).

Relations among the masses of neighboring nuclei provide an accurate and convenient method for the estimation of unknown masses. A set of such relations is "derived" and their structure as partial difference equations is discussed. These considerations lead to a set of mass equations (solutions of the difference equations) that can be ordered such that each successive member gives a potentially more nearly accurate representation of nuclear ground-state energies as functions of N and Z. The first two members of this ordered set are the mass equations considered originally by Garvey et al. The results obtained by fitting the third member of this set to the known masses are discussed in this paper. This third mass equation is shown to satisfy the principle of charge symmetry to a good approximation. As a consequence, it gives predictions for the masses of proton-rich nuclei.

45783 Calculation of the coefficient of surface tension of a nucleus. Ivanov, Y.B. (I. V. Kurchatov Insititute of Atomic Energy). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 17-21(Jul 1977).

The coefficient of surface tension of a nucleus is calculated on the basis of the theory of oscillations in a Fermi-liquid drop. The self-consistency of the calculational method is discussed.

45784 Moments of inertia and gyromagnetic ratios of compound states. Bunatyan, G.G. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 22-28(Jul 1977).

The method of temperature-dependent Green's functions is applied to calculate the average values of the moments of inertia F and the collective g factors for compound states of deformed nuclei. The dependence of F and g on the excitation energy and on the value of the pair-correlation energy Δ of the compound state is investigated. The possible consequences, to which a change of the deformation in an excited state relative to the ground state and a dependence of Δ on the deformation may lead, are discussed.

45785 Boson approximation in deformed atomic nuclei. Medvedev, B.I. (Moscow Evening Metallurgical Institute). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 28-31(Jul 1977).

The possibility of describing deformed even nuclei in a boson approximation with a small value of the boson's average angular momentum is considered. The rigidity of the nucleus upon a change of the moment of inertia is estimated in the model of Mariscotti.

45786 Limitations on the parameters of the superdense state of nuclei. Mikaelyan, L.A.; Skorokhvatov, M.D. (I. V. Kurchatov Institute of Atomic Energy). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 618-619(Jun 1977).

The problem of the existence of stable superdense nuclei is analyzed on the basis of available experimental data. Limitations are found on the height of the barrier separating the ordinary state and the hypothetical superdense state.

45787 Microscopic K-matrix approach to the continuous spectrum in the four-nucleon problem. Baryshnikov, A.G.; Blokhintsev, L.D.; Narodetskii, I.M. (Institute for Theoretical and Experimental Physics, State Atomic Energy Commission). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 620-624(Jun 1977).

Various two-particle reactions in a system of four nucleons are discussed in the many channel K-matrix method, in which K-matrix elements are approximated by exact Born terms in the integral equations for the four nucleons. Satisfactory agreement with experiment is obtained for scattering into the backward hemisphere at low and intermediate energies for all reactions except D(d,d)D. A systematic investigation of the accuracy of the different approximations frequently used in the theoretical description of nuclear reactions in various models is undertaken.

NUCLEAR MATTER

REFER ALSO TO CITATION(S) 45808

45788 Dynamics of nuclear fluid. IV. Some spin and isospin properties in the hydrodynamical model. Wong, C. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev., C;* **17**: No. 5, 1832-1847(May 1978).

In the hydrodynamical model, the nuclear spin and isospin symmetry energies and the speeds of spin sound and isospin sound are pertinent to the determination of the static and dynamic properties of finite nuclei. We examine these quantities with a generalized Skyrme interaction. From the explicit expressions we obtain for these quantities, we find an interesting algebraic relation connecting the symmetry energies and likewise the sound speeds. Relevant collective vibrational energies of various types and different multipolarities are evaluated with the known sets of Skyrme interactions, in order to provide information for future amendments or selections among the sets of interactions and for the confrontation of the hydrodynamical model with experiment. We further investigate the dispersion of sound waves due to the range of the nuclear interaction. In particular, the "plasma oscillation" arising from the long-range Coulomb interaction is found to lead to a simple modification of the energies of the isoscalar and isovector collective vibrational states. When applied to the nuclear giant dipole and monopole resonances, the inclusion of the plasma oscillation gives an improved agreement between the hydrodynamical and the experimental giant dipole state energies and modifies the nuclear incompressibility extracted from measured giant monopole energies by as much as 15%.

45789 Vacuum polarization in strong fields and pion condensation. Migdal, A.B. (L. D. Landau Institute of Theoretical Physics, USSR Academy of Sciences, Chernogolovka (Moscow oblast')). *Sov. Phys. - Usp. (Engl. Transl.);* **20**: No. 11, 879-898(Nov 1977).

A detailed review is given of the theory and applications of vacuum fluctuations in the vicinity of a supercharged nucleus.

45790 Relaxation of pion fields in nuclear matter. Galitskii, V.M.; Mishustin, I.N. (I. V. Kurchatov Institute of Atomic Energy). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 420-422(5 Oct 1977).

We consider the behavior of a classical pion field in nuclear matter in the case when its initial value is not equal to the equilibrium value. Assuming that the principal dissipation mechanism is Landau damping, we obtain the time of relaxation of the pion field to the equilibrium value, which turns out to be much shorter than the collision time of heavy ions with energies of several hundred MeV per nucleon.

45791 One-boson exchange potentials and their use in low energy nuclear physics. Savushkin, L.N.; Fomenko, V.N. (M. A. Bonch-Bruevich Leningrad Electrotechnical Communications Institute; All-Union Scientific Research Institute of Electrical Measuring Instruments, Leningrad). *Sov. J. Particles Nucl. (Engl. Transl.);* **8**: No. 3, 371-390(Jul 1977).

Some aspects of the modern meson theory of the NN interaction and its use to describe nuclear matter and finite nuclei are considered. The one-boson exchange potential (OBEP) is introduced, and considered in application to nucleon-nucleon scattering, the properties of the deuteron, and quasinuclear resonances. Its application to nuclear matter and also to finite nuclei in the framework of relativistic Hartree and Hartree-Fock theories is described.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 45641, 45779, 45809

45792 Extension of core polarization in inelastic scattering to include charge-exchange reactions. Brown, V.R.; Madsen, V.A. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Rev., C;* **17**: No. 6, 1943-1954(Jun 1978).

An earlier formulation rougly relating core-polarization effects for different external fields, electromagnetic (p,p'), (α,α'), etc., through a 2 x 2 core-polarization matrix has been generalized to include charge-exchange reactions under the assumption that the isospin of the nuclear states is pure. The pure isovector field of the direct charge-exchange reaction to an excited-analog state has both an isovector and an isoscalar field for the model space as in inelastic scattering. A crude schematic representation of the giant resonances, virtually excited by interaction with the model space and responsible for the core polarization, is used to estimate the effect on the core-polarization parameters of imposing isospin conservation. The results of the earlier formulation are changed only slightly. Direct excitation of giant-quadrupole resonances in ^{208}Pb by (p,p') and (n,p) are compared. Energy shifts of the T/sub greater-than/ and T/sub less-than/ isovector giant-quadrupole resonances are compared with the corresponding dipole shifts.

45793 Volume versus surface sampling of Maxwellian distributions in nuclear reactions. Goldhaber, A.S. (Nuclear Science Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Phys. Rev., C;* **17**: No. 6, 2243-2244(Jun 1978).

The pre-exponential factor in a thermal distribution of classical particles depends on whether the particles have been emitted from the surface of a hot body or are contained in a volume of gas of given temperature. Precisely the appropriate factors describe nuclear evaporation of very low energy neutrons (volume sampling) or moderate energy fragments (surface), as well as the high energy processes of projectile fragmentation and "fireball" breakup (volume).

45794 Spin-orbit terms in heavy-ion elastic scattering potentials. Petrovich, F.; Stanley, D.; Parks, L.A.; Nagel, P. (Department of Physics, The Florida State University, Tallahassee, Florida 32306). *Phys. Rev., C;* **17**: No. 5, 1642-1645(May 1978).

A general double folding prescription is used in conjunction with a realistic G matrix interaction to estimate the strength of the elastic spin-orbit potential for several heavy-ion systems. The potentials obtained give a reasonable description of recent elastic asymmetry data obtained with polarized ^{6}Li ions, but they are much smaller than those assumed in recent analyses of some heavy-ion transfer reactions. The calculated spin-orbit potentials have essentially no effect on elastic angular distributions.

45795 Comments on alternate formulations for preequilibrium decay. Blann, M. (Department of Chemistry and Nuclear Structure Research Laboratory University of Rochester, Rochester, New York 14627). *Phys. Rev., C;* **17**: No. 5, 1871-1875(May 1978).

The physical and mathematical differences of several formulations for preequilibrium decay are discussed. Mathematical models and examples are presented or referred to in order to illustrate what the author believes to be errors in the exciton formulation as being due to improper inclusion of spectator effects. An earlier work of Gadioli et al. is reinterpreted, and quotations therein to work of the present author are corrected.

45796 Modified optical potential for the elastic scattering of complex particles. Wall, N.S.; Cowley, A.A.; Johnson, R.C.; Kobos, A.M. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *Phys. Rev., C;* **17**: No. 4, 1315-1321(Apr 1978).

A modification to the usual six-parameter Woods-Saxon parameterization of the optical model for the scattering of composite particles is proposed. This additional real term reflects the effect of coupling other channels to the elastic scattering. The analyses favor a repulsive interaction for this term, especially for α particles. It is found that the repulsive term, when combined with a Woods-Saxon term, yields potentials with central values and volume integrals similar to those found by uncoupled elastic scattering calculations. These values are V (r = 0 ~ 125 MeV and J/4A ~ 300 MeV fm^3.

45797 Theory of the low-energy pion-nucleon interaction. Banerjee, M.K.; Cammarata, J.B. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *Phys. Rev., C;* **17**: No. 3, 1125-1144(Mar 1978).

A once-subtracted form of the Low equation for the pion-nucleon scattering amplitude is derived, with partial conservation of axial-vector current used to define the amplitude when one pion is off the mass shell. The static approximation is not made and both the seagull terms and the antinucleon contribution (z graphs) are retained. The theory is applied to calculate the S-wave amplitudes in the elastic scattering region. Good agreement is found with the phase shift fits to the data when we use vertical-barg/sub π/(4M^2) vertical-bar = 11.69 and 25.5 MeV for the πN σ commutator. The implications of this work for the analysis of low-energy elastic scattering of pions form nuclei are discussed. In particular, we point out how this work establishes the presence of a Laplacian term in the pion-nucleus optical potential with a magnitude that is fixed from the value of the σ commutator.

45798 (AD-A—048311) Interactions of high-energy particles and atomic nuclei with nuclei (chapter 7 thru 11). Barashenkov, V.S.; Toneyev, V.D. 13 Jul 1977. Translated from pp 468-648 of Vzaimodeystviya Vysokoenergeticheskikh Chastits i Atomnykh Yader S Yadrami (USSR), 1972. (FTD-ID(RS)T—1069-77). 510p. NTIS PC A22/MF A01.

Chapter titles are as follows: Intranuclear Cascades with Many-Body Interactions; Emission of Complex Particles; Fragmentation; Nuclear Fission; and Inelastic Collisions of Nuclei.

45799 Description of backward maxima in cross sections with allowance for exchange processes. Zelenskaya, N.S.; Teplov, I.B.; Yushchenko, T.A. (Institute for Nuclear Physics of the Moscow State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 32-36(Jul 1977).

General formulas for the amplitudes of exchange processes are obtained in the impulse approximation with allowance for interference of the amplitudes of individual mechanisms and for the coherent contribution from various states of the intermediate nucleus. In the example of elastic scattering of α particles by ^{12}C it is shown that with our approach an elastic-scattering angular distribution can be obtained in agreement with experiment over the whole angular range of the final particles. The microscopic approach employed here is compared with various phenomenological models, which are used to explain the anomalously large backward maxima in the angular distribution for elastic scattering.

45800 Asymptotic behavior of partial amplitudes in three-particle reactions with rearrangement of particles. Ostrovskii, V.N. (Leningrad State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 36-40(Jul 1977).

The asymptotic behavior of the partial amplitudes F/sub L/ for the process 1+(23) →2+(13) for high angular momenta L has been calculated by means of the first Born approximation for the cases of short-range and Coulomb interaction between particles. Two exponential terms are present in the asymptotic behavior, the form of the exponential not depending on the nature of the interaction and being determined only by the collision energy and by the binding energies and masses of the particles. It is brought out which exponential is dominant, depending on the parameters of the problem. Limiting cases in which the mass of one or two particles significantly exceeds the other masses are considered.

45801 Effective Hamiltonian for radiative capture of pions by complex nuclei. Korenman, G.Y.; Popov, V.P. (Nuclear Physics Institute, Moscow State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 44-48(Jul 1977).

An effective Hamiltonian is obtained for the radiative capture of pions by complex nuclei. In contrast to that used previously, the Hamiltonian correctly takes into account gauge invariance, the dependence of the transition operator on the nucleon momentum inside the nucleus, and the d-wave contribution to the elementary amplitude. The result is a change of constants in the known terms of the effective Hamiltonian, as well as an appearance of additional terms. The role of various operators, depending on the orbital momentum of the meson before capture, is discussed.

45802 Separation of the fusion channel in heavy-ion reactions. Afanas'ev, G.N.; Shilov, V.M. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 48-51(Jul 1977).

A physically clear model, in which the fusion channel is separated from the reaction channel in a natural way, is presented.

45803 Integral equations of scattering theory and the strong-coupling method. Kholyavin, I.I.; Yakubovskii, O.Y. (Leningrad State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 94-97(Jul 1977).

A method is presented for constructing approximate equations, similar to those of the strong-coupling method, for the four-particle scattering problem. These equations are formulated for functions of a single vector variable, which can be interpreted as the wave functions of the relative motion of bound particle clusters. In contrast to the usual strong-coupling method, the elastic scattering, excitation, and rearrangement processes are described in a unified way.

45804 Backward peaks of the cross section in nuclear reactions and exchange processes. Teplov, I.B.; Zelenskaya, N.S.; Levedev,

V.M.; Spasskii, A.V. (Institute of Nuclear Physics, Moscow State University, Moscow). *Sov. J. Particles Nucl. (Engl. Transl.);* **8**: No. 3, 310-330(Jul 1977).

A review is made of the experimental data on the large-angle behavior of the cross sections of nuclear reactions A (x,y) B on light nuclei at energies $>$ or $\approx$ 15 MeV of the bombarding particles. Peaks in the cross section around 180° (backward peaks) are observed in many reactions induced by complex particles, but the backward peaks for reactions induced by α particles on light nuclei are the most characteristic. The various characteristics of the backward peaks and their dependence on the type of reaction, the energy of the particles, and the structure of the nuclei and their mass number are considered. The possible physical reasons for the appearance of the backward peaks and the ways in which they are described are discussed. The possibility of explaining the backward peaks by exchange processes associated with breakup of the target nucleus is analyzed in detail.

45805 Photoneutron reactions near threshold and the optical model of nuclei. Urin, M.G. (Moscow Engineering Physics Institute, Moscow). *Sov. J. Particles Nucl. (Engl. Transl.);* **8**: No. 3, 331-343(Jul 1977).

A semimicroscopic approach to the description of nuclear reactions with the excitation of giant resonances in spherical nuclei on the basis of the shell model is described. The valence mechanism of the γn reaction near threshold is considered in detail. The characteristics of the mean cross sections are expressed in terms of the shell model and optical model. A brief investigation is made of the damping of the giant dipole resonance and also the influence of the latter on El-photoneutron reactions near threshold.

45806 Effects of parity nonconservation on the inelastic scattering of leptons by nuclei ($0^+ \rightarrow 0^-$ transition). Moskalev, A.N. (Leningrad Institute of Nuclear Physics, USSR Academy of Sciences). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 630-635(Jun 1977).

The cross section for excitation of the nuclear transition $0^+ \rightarrow 0^-$ in the scattering of leptons by nuclei and the effects of parity nonconservation on this process due to the weak interaction between leptons and nucleons and also between the nucleons inside the nucleus are investigated. It is shown that the relative magnitude of the effects amounts to $\sim 10^-3$.

45807 Gas-dynamic mechanism of inelastic collisions of heavy nuclei at high energies. Ivanov, M.Y.; Kudeyarov, Y.A.; Stanyukovich, K.P.; Shirkov, G.D. (Joint Institute for Nuclear Research). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 685-689(Jun 1977).

The methods of mechanics of continuous media are used to treat, in the nonrelativistic approximation, collisions of nuclei at velocities higher than that of sound in nuclear matter. An analytic solution of the shock-wave equations with an approximate equation of state of the nuclear matter is obtained in a one-dimensional approximation. The results are used as initial conditions for the solution of the gas-dynamics differential equations that describe isentropic expansion of nuclear matter in vacuo. The obtained solution is used to construct the energy spectrum of the emitted particles. The experimental consequences of the proposed model are discussed.

45808 (ORNL-tr—4653) **Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material.** Baz, A.I. (AN SSSR, Leningrad. Inst. Yadernoj Fiziki). 1977. Translated by S.D. Blalock Jr. from pp 32-52 of XII Winter school, Leningrad, 1977. 15p. Dep. NTIS, PC A02/MF A01.

The problem of a superdense nuclear material and collisions of fast nuclei is examined as a method of obtaining the nuclear material, basic theoretical approaches, and their interrelations during the investigation of nuclear collisions. Obtained estimates are cited for the value of compression of the nuclear material. "Shock waves" in nuclei are discussed. The basic results of calculation experiments of the collision of fast nuclei performed on a computer in simple and complex cascade models, the relation of the nature of collision with the mass of nuclei, fragmentation, and methods of identifying peripheral and central collisions are presented.

NUCLEAR MOMENTS AND SPIN

REFER ALSO TO CITATION(S) 45788

SPONTANEOUS AND INDUCED FISSION

REFER ALSO TO CITATION(S) 45738

45809 Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model. Gupta, R.K. (Institut fuer Theoretische Physik der Johann Wolfgang Goethe Universitaet, Frankfurt am Main, Germany). *Sov. J. Particles Nucl. (Engl. Transl.);* **8**: No. 3, 289-309(Jul 1977).

The two-center shell model and its application to nuclear fission and heavy-ion collisions is briefly reviewed. Then, in the theory of fragmentation, the asymmetric two-center shell model is generalized by the introduction of two new dynamical collective coordinates of mass and charge asymmetry. The results are given of calculations of the mass and charge distributions of fission fragments, and a study is made of the mechanisms of formation of a compound nucleus, fusion-fission reactions, and quasifission in heavy-ion collisions.

NUCLEAR MODELS

REFER ALSO TO CITATION(S) 45792, 45809

45810 Note on recoupling coefficients for SU(3). Millener, D.J. (Brookhaven National Laboratory, Upton, New York 11973). *J. Math. Phys. (N.Y.);* **19**: No. 7, 1513-1514(Jul 1978).

A 6- ($\lambda\mu$) coefficient, denoted by Z and different from the usual U coefficient, associated with a specific recoupling of three irreducible representations of SU(3), is defined. A general 9- ($\lambda\mu$) coefficient, analogous to the unitary 9-J coefficient of the angular momentum Racah algebra, is then expressed in terms of the Z coefficient and two U coefficients. In this way problems associated with the existence of outer multiplicities in the products of irreducible representations of SU(3) are circumvented.

45811 Method of K harmonics and the shell model. Smirnov, Y.F.; Shitikova, K.V. (Institute of Nuclear Physics, Moscow State University, Moscow). *Sov. J. Particles Nucl. (Engl. Transl.);* **8**: No. 3, 344-370(Jul 1977).

The aim of the review is to compare the method of K harmonics (hyperspherical harmonics) and the translationally invariant shell model. Only nuclei with $A>4$ will be considered. For them, as will be seen, many results of the method of K harmonics are very similar to the corresponding results of shell calculations. This similarity is due to the fact that the wave functions of the method of K harmonics and the translationally invariant shell model have much in common. The structure of the wave functions of the two methods is considered, their connection with one another is analyzed, and then the results of calculations of various nuclear properties obtained by these methods are compared.

RADIATION AND SHIELDING PHYSICS

RADIATION PHYSICS

REFER ALSO TO CITATION(S) 45113

45812 Ranges of projectiles with $8<$ or $=Z<$ or $=20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon. Winsberg, L. (Physics Department, University of Illinois at Chicago Circle, Chicago, Illinois 60680). *At. Data Nucl. Data Tables;* **20**: No. 5, 389-396(Nov 1977).

Electronic stopping powers of various light elements in Ti, Fe, Ni, Cu, Ag, and Au have been reported recently. Earlier, measurements were made for the stopping of ^{16}O in Ni, Ag, and Au. With the aid of the Northcliffe-Schilling stopping-power tables these values were extrapolated to values of E/A equal to 0.0125 and 12.0 MeV/amu. Ranges calculated from these stopping-power values and the stopping powers themselves are presented.

45813 Direction dependent exponential biassing in Monte Carlo simulation of radiation transport in thick shields. Murthy, K.P.N. (Reactor Research Centre, Tamil Nadu, India). pp 598-604 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

A technique to enhance the efficiency of Monte Carlo method for deep penetration studies is described. While tracing a particle history through the shield, its pathlength between two collisions is artificially increased. This forces more particles deep into the shield. The path length stretching is done in such a way, as to increase the efficiency of the Monte Carlo method in computing the particle transmission through the shield. The magnitude of stretching is made dependent on the particle direction. This is investigated using two functional forms--linear and exponential. Suitable values of parameters for these two biassing schemes are recommended for shields of different scattering properties. The technique is then tried on a problem consisting of gamma-ray transport through a ducted shield. We find that, for this problem, the technique of direction dependent exponential biassing could improve the efficiency of Monte Carlo simulation by at least 25%.

45814 Partial-range expansion for multigroup Monte Carlo photon transport. Ward, J.T. Jr.; Scudiere, M.B. (Univ. of Virginia, Charlottesville). pp 613-621 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Truncated Legendre polynomial expansions are commonly used to describe angular scattering distributions in multigroup Monte Carlo transport codes. Here, the character of exact multigroup differential (angular) scattering amplitudes is examined for Compton scattering of gamma-rays. A partial-range expansion method is proposed, by which major drawbacks of the full-range representations currently in use are avoided; accurate low-order expansions are obtained, eliminating negative and unduly oscillating amplitudes. A redefined numerial technique is employed to process multigroup cross sections, engendering improved computational efficiency when compared with SMUG. Incorporation of the partial-range technique into MORSE permits discarding of discrete angles and weights for determining post-collisional flight directions, hence eliminating ray effects. Numerical and graphical comparisons of the new technique with both exact and full-range approximative scattering amplitudes are provided; its consideration as a useful tool in Monte Carlo transport calculations is recommended.

45815 Theory and use of Maniscalco two-medium buildup factors. Hungerford, H.E. (Purdue Univ., West Lafayette, IN). pp 668-679 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

This paper defines and describes buildup factors for gamma rays transmitted through adjacent slabs of two different materials. Three components of the transmitted scattered radiation are identified. The 2-medium buildup factor depends upon the amount of scattered radiation existing at the interface and its buildup during transmission through the second slab. Tables of buildup factors are presented, and two examples of their use in shield design are demonstrated.

45816 Integral tests of niobium cross sections through simultaneous measurements of neutron and gamma-ray leakage spectra. Ingersoll, D.T. (Oak Ridge National Lab., TN); Wehring, B.W.; Dorning, J.J. pp 841-848 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Simultaneous measurements of energy spectra were made for neutrons and gamma-rays leaking from a 25-cm diam niobium sphere containing a ^{252}Cf source. These spectra were compared to ANISN discrete ordinates calculations to provide an integral test of niobium fast-neutron cross sections. Calculations based on ENDF/B-III data were in reasonably good agreement for both the neutron and gamma-ray leakage, while ENDF/B-IV data gave poorer agreement with the measured gamma-ray leakage. It is felt that inappropriate treatment of the inelastic cross section was responsible for the observed discrepancies.

SHIELDING CALCULATIONS AND EXPERIMENTS

REFER ALSO TO CITATION(S) 44740, 44767, 44769, 45718, 45814, 45822

45817 Generation and testing of the shielding data library EURLIB for fission and fusion technology. Caglioti, E. (Euratom, Ispra, Italy); Hehn, G.; Herrnberger, V.; Mattes, M.; Nicks, R.; Penkuhn, H. pp 482-493 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

For the common field of core physics and shielding, the CSEWG group structure of 239 fast neutron groups had been proposed, of which the 100 neutron groups of the EURLIB Library is a sub-set for shielding. This standard group Library EURLIB had been initiated by the NEA-specialist group on shielding benchmarks in 1974. The wide acceptance of the Library for interpretation of benchmarks in the NEA program represents an important step forward in the standardization of group data which is the basic requirement for a useful collaboration. On the other side the interpretation of a series of different benchmark experiments with the EURLIB Library provides the best check of the cross section data for neutron and gamma-rays showing the needs for further improvements. The paper describes the joint work of IKE, Stuttgart and EURATOM, Ispra in generating multigroup libraries for neutron and gamma-rays. Special effort has been devoted to improve the flux weighting for both types of radiation and proper treatment of thermal neutrons. The coupled multigroup Library of 100 neutron and 20 gamma groups is collapsed into few group structures for typical designs of LWR, LMFBR, gas cooled and thermonuclear reactors. The work for optimal few group representation is done in cooperation with EIR, Wurenlingen. The testing of the EURLIB Library is a common effort of several institutions participating in the NEA shielding benchmark program.

NEUTRON INTERACTIONS WITH MATTER

REFER ALSO TO CITATION(S) 45816

45818 Polynomial solutions to the tensorial differential equations for monoenergetic neutrons in slab and sphere geometries. Landini, P. (Univ., Bologna); Spiga, G.; Premuda, F. *Nucl. Sci. Eng.;* **66**: No. 3, 295-306(Jun 1978).

The singular differential equations of arbitrary order, derived in a tensorial approximation to the integral transport for monoenergetic neutrons in slab and sphere geometries, are solved by a power series expansion without imposing any boundary conditions. The relation to the exact integral transport approach is theoretically studied, and numerical calculations for the tensorial differential approach are worked out.

45819 Evaluation of the neutron flux-depression factor via the integral transform method. Boffi, V.C.; Molinari, V.G.; Spiga, G. (Univ., Bologna). *Nucl. Sci. Eng.;* **66**: No. 3, 424-428(Jun 1978).

The integral transform method is used to solve a two-region problem relevant to the evaluation of a neutron flux-depression factor. For the latter, numerical results are reported for different values of the physical parameters involved and compared with those obtained through other methods.

45820 Simultaneous global calculation of flux and importance with forward Monte Carlo. Deutsch, O.L. (Massachusetts Inst. of Tech., Cambridge); Carter, L.L. pp 580-589 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

A procedure is described for obtaining flux and importance globally in one Monte Carlo calculation at small to moderate incremental cost in terms of the time required to process a fixed number of particle histories. The application of this procedure and analysis of results are illustrated for a prototypical controlled thermonuclear reactor (CTR) streaming problem with coolant pipe penetrations through a concrete magnet shield. Our experience indicates that the availability of global information about both flux and importance can help to generate intuition in multidimensional shielding problems and can be of significant value during the early phase of shield design.

45821 Monte Carlo Track Rotation Estimator. Dubi, A.; Horowitz, Y.S. (Ben Gurion Univ, Negev Beersheva, Israel). pp 590-597 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The Track Rotation Estimator (TRE) is a radically new approach to the Monte Carlo calculation of the total flux at a point which is based upon the use of compensated rotational symmetry. The basic formulation and features of the new estimation procedure are briefly discussed followed by the presentation of results for three dimensional calculations which illustrate the important result that under conditions of low absorption, the TRE brings about an order of magnitude improvement on σ^2tau over the once collided flux estimator (OCFE) and the uncollided flux estimator (UCFE). This development could be highly significant for deep penetration calculations.

45822 Neutrons streaming through conical ducts. de Beer, G.P. (Atomic Energy Board, Pretoria). pp 645-651 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

The thermal flux densities and different components thereof along the axes of conical ducts in a water medium have been calculated by means of a Monte Carlo program using differential albedo data for curved reflection surfaces. Computational results have successfully been tested against experimental data under simulated conditions. The calculations have been extended to neutron

sources with various angular distributions (monodirectional, cosine and isotropic). The results obtained generally show a more rapid decrease of the flux density components for those ducts tapering down with greater angles, as well as for neutrons from the more isotropic sources. Neutrons entering the ducts through their front ends and reaching detectors after one or more wall reflections constitute in most cases the dominant component over the duct lengths studied. Exceptions to the general tendencies mentioned above do, however, exist in some of the cases studied.

45823 Sensitivity analysis for shielding data evaluation by interactive graphics computing. Parvez, A.; Becker, M. (Rensselaer Polytechnic Inst., Troy, NY). pp 777-784 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Interactive graphics computing capabilities have been developed at RPI to carry out parametric studies to determine the sensitivity of integral measurements to the cross section uncertainties. It is possible to display and interactively manipulate the individual cross sections and the secondary distribution of the scattered neutrons and then directly calculate the impact of cross-section changes on the final results. Using this interactive graphic technique, sensitivity studies and direct adjustments have been carried out to obtain quantitative interpretations of the theory-experiment discrepancies found in determining the neutron spectra in the assemblies of uranium, iron, and sodium.

45824 Neutron quasialbedos from plane reflectors. Abagjan, A.A.; Germogenova, T.A.; Dubinin, A.A.; Zhuravlyov, V.I.; Klimanov, V.A.; Mashkovitch, V.P.; Stroganov, A.A. pp 922-930 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Integral and differential characteristics of quasialbedos of neutron gamma quantum type (absolute values) for a plane monodirectional source of neutrons of various energies incident at an arbitrary angle on reflectors of different materials have been studied theoretically and experimentally. The comparative results of contributions to the total absorbed dose of the reflected radiation due to albedos and quasialbedos for neutrons of different energies and materials are presented. A two-group semi-empirical model used to describe integral and differential characteristics of thermal, slow and intermediate neutron quasialbedos for different materials has been proposed.

MEDICAL PHYSICS

RADIATION PROTECTION STANDARDS

45825 Shielding standards: a case history. Battat, M.E. (Los Alamos Scientific Lab., NM). pp 457-462 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

A discussion of the sequence of events leading from the inception of a standard to its transmittal to the ANSI Board of Standards Review will be given. The standard referred to is entitled, "Neutron and Gamma-Ray Flux-to-Dose-Rate Factors," (ANSI N666). Certain questions raised during the review process and the compatibility of this standard with the USA Code of Federal Regulations will be discussed.

RADIATION SOURCE CALIBRATION AND STANDARDIZATION

45826 Transport of neutron and secondary gamma radiations through a liquid air sphere surrounding a 14-MeV neutron source. Sidhu, G.S.; Farley, W.E.; Hensen, L.F.; Komoto, T.; Pohl, B.; Wong, C. (Univ. of California, Livermore). *Nucl. Sci. Eng.;* **66**: No. 3, 428-433(Jun 1978).

The spectra for the neutron and secondary gamma rays due to a 14-MeV neutron source was remeasured by replacing liquid nitrogen, used in earlier work, with liquid air (LA) as the transport medium. The deuterium-tritium neutron source was located at the center of the sphere (129.3-cm radius) of LA (20.7 at. % O_2, remainder N_2). Scintillation detectors were located at a distance from the sphere. Using time-of-flight techniques, approximate neutron energy information was obtained by measuring the time-of-arrival of neutrons at the detectors. Also measured, in a 60-ns time window before the arrival of 14-MeV neutrons, was the gamma-ray spectrum that results from inelastic neutron interactions in LA. To compare the measured spectra with code calculations, the detector efficiencies and experimental parameters were folded into the calculated output of TARTNP, the coupled neutron-photon Monte Carlo transport code of Lawrence Livermore laboratory. The calculated spectra for gamma rays and neutrons and the calculated radiation doses show good agreement with the measurements. The results provide a benchmark point on a radiation dose versus range-in-air curve obtained by the TARTNP calculations.

DOSIMETRY

45827 (BNL—24330) Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison. Varma, M.N.; Baum, J.W.; Kliauga, P. (Brookhaven National Lab., Upton, N.Y. (USA)). May 1978. Contract EY-76-C-02-0016. 16p. (CONF-780534—4). Dep. NTIS, PC A02/MF A01.

From 6. symposium on microdosimetry; Brussels, Belgium (May 1978).

Energy deposition in one micron diameter volumes at distances of one and two microns from the ion's path has been estimated based on previously reported radial dose measurements made using a mesh wall ionization chamber. In these estimations it was assumed that radial dose varied inversely as the square of the radial distance. Ionization chamber measurements were reported for heavy ions (atomic number 1 to 53) having specific energies from 0.25 to 2.5 MeV per atomic mass unit (MeV/amu) and from 230 to 377 MeV/amu. Energy depositions were also measured using a wall-less gas proportional counter, and were reported by Kliauga and Rossi. Ions used in the proportional counter technique were 6.6 MeV/amu lithium and 10 and 23 MeV/amu protons. A comparison of results estimated from ionization chamber studies and measured using proportional counters is reported here. This comparison was facilitated by normalization in terms of Z^2/sub eff/ and specific energy of the incident ions. Proportional counter results were in apparent agreement with ion chamber results for 23 MeV/amu protons but were lower than ion chamber results by approximately 50 percent for 10 MeV/amu protons and 60 percent for 6.6 MeV/amu lithium ions.

45828 Thermoluminescence of LiF TLD-100: Emission-spectra measurements. Fairchild, R.G.; Mattern, P.L.; Lengweiler, K.; Levy, P.W. (Brookhaven National Laboratory, Upton, Long Island, New York 11973). *J. Appl. Phys.;* **49**: No. 8, 4512-4522(Aug 1978).

The thermoluminescence of LiF TLD-100 dosimeter crystals was studied with equipment for determining simultaneously the emission intensity and spectrum as a function of temperature. Measurements were made on samples exposed to ^{60}Co irradiations at room temperature at exposures varying from 500 to 3×10^7 R. Spectra were obtained at 1.38 and 5.5 °C intervals over the temperature range 20—350 °C. Below 10^5 R the thermoluminescent emission can be described by a single Gaussian-shaped band whose peak energy and full width vary irregularly with temperature and not in accord with the well-known expressions relating the emission-spectra peak energy and fwhm width to the sample temperature. However, the emission is accurately described by three Gaussian-shaped bands whose approximate peak energies and full widths are 3.01, 0.90; 2.90, 0.72; and 2.71, 0.96 eV. The peak energies and full widths of these three bands vary with temperature in the expected manner. In addition to these bands, comparatively low-intensity bands are observed at exposures above 10^5 R at approximately 4.0, 2.98, 2.50, and 2.3 eV, with the possibility of another band at roughly 1.5 eV. The recorded data for each emission band was subjected to all corrections required to obtain glow curves which are strictly proportional to the number of processes occurring per unit time; i.e., the corrected glow curves are as free as possible of the systematic errors which might render them unsuitable for determining the kinetics. The glow curves extend from room temperature to 350 °C and contain nine prominent glow peaks. Below approximately 80 °C, the emission is confined to the 2.71-eV band. Above approximately 200 °C, the emission is confined to the 3.01-eV band. All three prominent emission bands contribute to the intermediate-temperature glow peaks. With increasing dose, the low-temperature peaks progressively diminish in intensity and the emission shifts to the higher-temperature peaks.

45829 Thermoluminescence of LiF TLD-100: Glow-curve kinetics. Fairchild, R.G.; Mattern, P.L.; Lengweiler, K.; Levy, P.W. (Brookhaven National Laboratory, Upton, Long Island, New York 11973). *J. Appl. Phys.;* **49**: No. 8, 4523-4533(Aug 1978).

The thermoluminescence kinetics have been determined for the 13 glow peaks contained in the glow curves obtained from LiF TLD-100 after exposure to ^{60}Co irradiations. The glow curves were constructed from measurements made with recently developed equipment for recording emission spectra at closely spaced temperature intervals. In addition, the recorded data has been subjected to all corrections needed to make it suitable for reliable kinetic analysis.

The recorded emission spectra can be described by a single Gaussian-shaped band whose width and peak-energy parameters vary erratically with temperature or, alternatively, by resolving the observed spectra into three Gaussian-shaped bands whose parameters vary with temperatures in accord with theoretical expressions relating the emission-spectra peak energy and full width at half-maximum to the sample temperature. The kinetics and kinetic parameters were independently determined for the two most intense resolved emission bands. All peaks are described by first-order kinetics and the independently determined parameters are in very good agreement. The glow curves for the least intense component are also described by the same kinetics and parameters. Inasmuch as the single-band emission is a superposition of the three components, the same kinetics and parameters apply to the glow curve constructed from unresolved spectra. Thenominal peak temperature in °C, the activation energy and preexponential factor s (sec^{-1}) for the 13 peaks observed are reported. The unusual value of $s = 10^{22}$ for the 190 °C peak, previously reported by other authors, was obtained during this study. However, it appears that this value can be obtained from relatively simple mechanisms, and one of these is described.

45830 (LA-tr—77-72) **Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays.** Heinzel, F.; Mueller-Duysing, W. (Stadtspital Waid and Triemli, Zurich (Switzerland). Klinik fuer Nuklearmedizin und Radiotherapie). 1977. Translation of PK-AN—72-2. 7p. Dep. NTIS, PC A02/MF A01.

An experiment is proposed to carry out comparative dose measurements on various tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60 gamma rays. Measurements of dose in water phantoms of bones, fat, and air-filled cavities are planned, along with measurements of dose in the Alderson-Rando-Phantom. (GHT)

SOLID STATE PHYSICS

REFER ALSO TO CITATION(S) 45084

45831 (COO—4385-1) **Minimum entropy production principle and Ostwald ripening.** Kuczynski, G.C. (Notre Dame Univ., Ind. (USA)). Feb 1978. Contract EG-77-S-02-4385. 17p. Dep. NTIS, PC A02/MF A01.

The problem of growth of particles in a medium capable of transmitting matter has been a subject of past theoretical treatments. All of them have tried to find a steady-state solution to a continuity equation containing a distribution function for particle size, coupled with an expression for rate of change of particle size, usually obtained from a mean field approximation. No attempt has been made to derive the distribution function from a more general principle. The objective of this note is to demonstrate that a distribution function can be obtained from a general principle such as the principle of minimum rate of entropy production.

45832 (LA—7291-MS) **Breakup of an accelerated shell owing to Rayleigh—Taylor instability.** Suydam, B.R. (Los Alamos Scientific Lab., N.Mex. (USA)). Jun 1978. Contract W-7405-ENG-36. 15p. Dep. NTIS, PC A02/MF A01.

A simplified model for the Rayleigh-Taylor instability of an accelerated shell is examined, and it is found that the most dangerous wavelength to be about that of the shell thickness. The shell material is assumed to be an inviscid, incompressible fluid. Effects of finite compressibility and of surface tension are found to be negligible, but the effects of viscosity are shown to be very large. The need for better knowledge of viscosity at high pressure is pointed out.

45833 Diffusion coefficient determination using a size-variation technique. Stark, W.A. Jr. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Appl. Phys.;* **49**: No. 8, 4583-4585(Aug 1978).

Conventional techniques for determining diffusion coefficients in solids measure the rate of approach to saturation. A alternative technique, which does not require saturation, determines the diffusion coefficient by a comparison of the solute uptake in two or more different size particles after some definite exposure time. A description of this procedure for spherical particles is presented, together with a working nomograph suitable for the planning and quick analysis of experiments.

45834 Critical dynamics of a Heisenberg spin-glass. Hertz, J.A.; Klemm, R.A. (The James Franck Institute and the Department of Physics, The University of Chicago, Chicago, Illinois 60637). *Phys. Rev. Lett.;* **40**: No. 21, 1397-1400(22 May 1978).

The spin-glass transition of a magnetic materials with quenched impurities is studied with use of perturbative mode-mode coupling theory, without the use of the replica method. In mean-field theory we find that the transport coefficient Gamma-tilde diverges just above the spin-glass freezing temperature T/sub f/ like (T - T/sub f/)/sup -1/2/ for $d > 4$ and (T - T/sub f/)/sup 2/d/-1 for $2 < d < 4$.

45835 Hydrodynamic approach to electron-hole droplet nucleation and stability. Silver, R.N. (Theoretical Division, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev., B;* **17**: No. 10, 3955-3971(15 May 1978).

A hydrodynamic model for the nonequilibrium thermodynamics of electron-hole droplets in semiconductors is presented. It predicts droplet properties at densities and temperatures where the assumptions of nucleation kinetics fail. It is an extension to finite lifetimes of the Cahn-Hilliard theories of critical droplets and spinodal decomposition. As in finite-lifetime nucleation kinetics both critical and stable droplets are found to exist above a minimum supersaturation which must become large at low temperatures. However, stable droplets differ both quantitatively and qualitatively from the capillarity approximation commonly assumed in nucleation kinetics. For example, they may be characterized by a velocity profile which peaks in the surface region. Among other novel predictions are that: (i) a maximum supersaturation before phase separation is given by the spinodal line; (ii) stable droplets continue to exist at temperatures approaching T/sub c/ but their properties are strongly affected by impurity and phonon scattering; and (iii) at very low temperatures critical droplets are too small for hysteresis, but stable droplet properties are calculated. Quantitative predictions are made by the principle of corresponding states.

45836 Diamond-metal interfaces and the theory of Schottky barriers. Ihm, J.; Louie, S.G.; Cohen, M.L. (Department of Physics, University of California, Berkeley, California 94720). *Phys. Rev. Lett.;* **40**: No. 18, 1208-1211(1 May 1978).

A self-consistent pseudopotential calculation of the diamond-metal interface is used to examine interface states and empirical correlation for the dependence of the Schottky-barrier height and interface index, S, on ionicity. The properties of dimaond are crucial because of its large gap and zero ionicity. Predictions based on experimental extrapolations give $S \simeq 0$. Our calculations give $S = 0.4$ and a barrier height of 2.2 eV; the latter is in good agreement with experiment.

45837 Some effects of anisotropic vibrations in LEED. Ulehla, M.; Davis, H.L. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Vac. Sci. Technol.;* **15**: No. 2, 642-646(Mar 1978).

A formalism is presented which enables effects of certain types of vibrational anisotropy to be included in LEED calculations. Results from a demonstration calculation are presented and compared with a similar calculation where no anisotropy was present.

SUPERCONDUCTIVITY

GENERAL THEORY

45838 Theory of phase transitions in nonequilibrium superconductors with allowance for phonon reabsorption. Elesin, V.F. (Moscow Engineering-Physics Institute). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 10, 1744-1748(Oct 1977).

The behavior of a nonequilibrium superconductor is investigated near the point of the phase transition that takes place under the influence of optical pumping. Nonequilibrium quasiparticles are produced on account of absorption of an electromagnetic field of frequency much higher than the superconductor gap. The energy relaxation of the quasiparticles leads to production of nonequilibrium phonons whose number is determined by a parameter γ equal to the ratio of the time of departure of the phonons from the sample and the phonon-reabsorption time. The dependence of the superconductor order parameter on the pumping is obtained and it is shown that this dependence remains doubly valued at arbitrary values of the parameter, while the critical power decreases in the ambiguity region with increasing γ. Starting with an analysis of the combined system of equations for the quasiparticles and the phonons it is found that the quasiparticle distribution function depends little on γ at the phase transition point and is close to equilibrium with a zero quasiparticle chemical potential.

45839 Surface superconductivity in layered compounds. Mineneko, E.V.; Kulik, I.O. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 10, 597-604(Oct 1977).

The features of surface superconductivity onset in layered superconductors with Josephson and correlation layer interactions are studied. It is shown that in comparison with ordinary type-II superconductors the situation in layered compounds is more complicated. The region of surface superconductivity is determined by the ratio of the correlation and Josephson interactions, T/sub U/ and T/sub J/. The possibility is shown of direct determination of the

constants T/sub U/ and T/sub J/ in layered metals from experiments on surface superconductivity.

45840 Effect of resonance oscillations of the order parameter on the tunnel current in superconductors. Mitsai, Y.N.; Rozhavskii, A.S. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 10, 650-651(Oct 1977).

The effect of resonance oscillations of the order parameter on the tunnel current in an S—I—S system is analyzed here. It is shown that anomalies of the Riedel kind characterize the quasiparticle current. The analysis here applies to temperatures below T/sub c/.

45841 Electrostatic interaction between dislocations in a superconductor. Miloshenko, V.E.; Poshchupkin, A.M.; Shunin, G.E. (Polytechnical Institute, Voronezh). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 9, 542-544(Sep 1977).

We investigate the electrostatic contribution to the interaction energy of two parallel edge dislocations and its change due to decreased electron screening at the superconducting transition. It is shown that the decrease of screening leads to a much greater change in the single dislocation energy than the spatial inhomogeneity of the order parameter.

45842 Distribution of nonequilibrium excitations and phonon generation in superconducting tunnel junctions. Kirichenko, I.K.; Seminozhenko, V.P. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 8, 479-486(Aug 1977).

On the basis of the complete system of equations which describe the nonequilibrium states of S_1—I—S_2 tunnel junctions caused by a quasiparticle current, distributions are obtained of the electron excitations in S-films of a symmetry junction (identical films forming a tunnel junction) for arbitrary transparencies of the tunnel barrier in the case Tvery-much-less-thanΔ, (eV: 2Δvery-much-less-than2Δ is the applied voltage, and Δ is the energy gap). The effect of suppressing the superconductivity in the nonequilibrium state (eV$>2\Delta$) is considered. A theory is given for the generation of phonons with the frequency $\omega >$ or $=2\Delta$ by quasiparticle tunneling. Results of already known experiments are explained and new features of the distribution of recombination phonons being generated are predicted.

45843 Properties of superconducting microbridges in the pure limit. Kulik, I.O.; Omel'yanchuk, A.N. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 7, 459-461(Jul 1977).

An exact solution of Eilenberger's equations for a superconducting microbridge in the limit avery-much-less-thanξ_0, avery-much-less-thanl is given (a is the radius of the constriction between the superconductors, l is the mean free path and ξ_0 is the coherence length). The current is independent of the ratio between l ξ_0 and is expressed in terms of the contact resistance in the normal state. When T=0, the magnitude of the critical current exceeds the critical current of the tunnel contact with the same resistance, by a factor of two.

45844 Coexistence of the dielectric and superconducting states in quasi-one-dimensional systems. Timerov, R.K. (I 7420-z). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1214-1221(Jun 1977).

The behavior of the Peierls instability as a function of the location of the electron Fermi level ϵ/sub k/F is investigated. It is shown that, when the level to which the one-dimensional band is filled deviates from the middle of the band by μ, the wave vector, Q, of the charge density wave (CDW) is not equal to 2k/sub F/, and the dielectric gap, Δ/sub p/, is shifted with respect to the Fermi level. Although a state with a CDW is an ordered state of the dielectric type, it has, starting from $\mu > \Delta$/sub p/, even at T=0, free carriers above the gap Δ/sub p/ (to the extent of the noncoincidence of Q and 2k/sub F/). If bare attraction exists in the Cooper channel, then a state with a CDW still turns out to be unstable against superconducting ordering, and the coexistence of superconductivity and CDW becomes energetically advantageous at $\mu > \Delta$/sub p/.

ACOUSTIC, ELECTRIC, MAGNETIC, OPTICAL, AND THERMAL PHENOMENA

45845 (IS-M—137) Critical currents of a one-dimensional array of superconducting vortices in a periodic pinning potential. Clem, J.R.; Martinoli, P. (Ames Lab., Iowa (USA)). 1978. Contract W-7405-ENG-82. 8p. Dep. NTIS, PC A02/MF A01.

A theoretical study of the static interaction of a vortex chain with a periodic pinning potential is presented. The critical currents for matching and nonmatching configurations of the array are deduced from a model based on the formation of a vortex-defect superlattice. It is shown that defects (vacancies or interstitials) along the vortex chain are essential to produce a significant pinning effect.

45846 Thermoelectric effect in superconducting alloys with an ordered magnetic moment distribution. Kon, L.Z. (Institute of Applied Physics, Academy of Sciences of the Moldavian SSR, Kishinev). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 12, 2160-2161(Dec 1977).

The contribution to the thermoelectric coefficient of a superconducting alloy due to magnetic impurities which have a nonzero total magnetic moment is considered.(AIP)

45847 Electric field in gapless superconductors. Shelankov, A.L. (M. I. Kalinin Leningrad Polytechnic Institute). *Sov. Phys. - Solid State (Engl. Transl.);* **19**: No. 11, 1903-1907(Nov 1977).

The behavior of the electric field in gapless superconductors with a small pair-dissociation parameter is studied. The gapless superconductor state is assumed to be due to the presence of a low concentration of paramagnetic impurities or due to a magnetic field parallel to the surface of a thin film. In contrast to a high-concentration of paramagnetic impurities, it is necessary to evaluate the nonequilibrium distribution function for all energies. As a result, the penetration depth of an electric field differs from the coherence length and depends on the inelastic relaxation time. The inelastic effects are required to scatter particles to the low-energy region where the relaxation rate of the nonequilibrium distribution function is high. The effect of paramagnetic impurities and a magnetic field on the electric field in a superconductor is also discussed. It is shown that a low concentration of impurities and a weak magnetic field alter significantly the penetration depth of the electric field. With some qualifications, the present results remain valid even for superconductors with a gap.

45848 Raman sound scattering in normal metals and superconductors. Geilikman, B.T.; Reizer, M.Y. (Institute of Chemical Physics, Academy of Sciences of the USSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 9, 545-549(Sep 1977).

Raman sound scattering (RSS) is considered in normal metals and in superconductors. The scattering amplitude, calculated by second order perturbation theory from the Froehlich Hamiltonian, has a resonance nature, enabling the observation of RSS at low temperatures in pure samples. High-frequency sound is considered in the two regions: A-ωvery-much-less-thanI and B-$\omega >>$I.

45849 Influence of a change in the topology of the Fermi surface on the coefficient of ultrasound absorption in superconductors. Palistrant, M.E. (Institute of Applied Physics, Academy of Sciences of the Moldavian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 8, 487-490(Aug 1977).

The coefficient of ultrasound absorption in superconductors is calculated when an ellipsoidal cavity or plane sections arise on the Fermi surface under pressure, and also for the rupture of a neck. A significant dependence of the coefficient of sound absorption on the geometry of the isoenergetic surface is obtained.

45850 Impedance of type II superconductors in the Shubnikov phase. Krasnov, Y.K. (Physics Institute, Academy of Sciences of the Georgian SSR). *Sov. J. Low Temp. Phys. (Engl. Transl.);* **3**: No. 8, 498-499(Aug 1977).

The impedance of type II inhomogeneous superconductors in the Shubnikov phase is calculated for small implitudes of the external current.

THEORETICAL PHYSICS

CLASSICAL AND QUANTUM MECHANICS

45851 (AD-A—048442) Macroscopic description of laser-type matter. Final technical report (3rd year), August 1976—August 1977. Senitzky, I.R. (Technion-Israel Inst. of Tech., Haifa). Sep 1977. 34p. NTIS PC A03/MF A01.

The relationship between the formalism developed previously for the macroscopic description of laser-type matter (macroscopic quantum mechanics) and several forms of semiclassical radiation theory are examined. It is shown that macroscopic quantum mechanics may be regarded as a generalization of conventional semiclassical radiation theory. The development of macroscopic quantum mechanics is carried further by extending its applicability to situations in which the atomic cooperation is less than maximum, and introducing a physically meaningful quantitative measure of the atomic cooperation for a given state. The theory is applied to a four-level laser for which atomic cooperation exists not only in the 'lasing' process but also in the pumping and relaxation processes. It is shown that under these conditions the laser exhibits properties similar to those of a parametric-amplifier with two idler frequencies.

45852 (AD-A—048446) New numerical methods applied to solving the one-dimensional eigenvalue problem. Interim report. Johnson, B.R. (Aerospace Corp., El Segundo, Calif. (USA). Ivan A. Getting

Labs.). 14 Nov 1977. Contract F04701-77-C-0078. 36p. NTIS PC A03/MF A01.

Two new numerical methods, the log derivative and the renormalized Numerov, are developed and applied to the calculation of bound-state solutions of the one-dimensional Schroedinger equation. They are efficient and stable; no convergence difficulties are encountered with double minimum potentials. A useful interpolation formula for calculating eigenfunctions at nongrid points is also derived. Results of example calculations are presented and discussed. (Author)

45853 Asymptotic behavior of bound eigenfunctions of Hamiltonians for single-variable systems. Morgan, J.D. III. (Department of Chemistry, University of California, Berkeley, California 94720). *J. Math. Phys. (N.Y.);* **19**: No. 8, 1658-1661(Aug 1978).

An extremely simple technique for examining the asymptotic behavior of bound eigenfunctions of Hamiltonians for single-variable systems is presented. A few simple examples are studied.

45854 Classical realization of quantum mechanics. Davidson, M. (Lawrence Berkeley Laboratory). *Found. Phys.;* **8**: No. 5, 481-492(May 1978).

A mechanism is presented by which a classical system could be described by the laws of quantum theory. Conflict with von Neumann's no-go theorem is avoided. Experimental predictions are made.

45855 Convergence properties of the Brillouin—Wigner type of perturbation expansion. Leinaas, J.M.; Kuo, T.T.S. (Institute of Physics, University of Oslo, Oslo, Norway). *Ann. Phys. (N.Y.);* **111**: No. 1, 19-37(Mar 1978).

We study the Brillouin—Wigner perturbation expansion of the model-space effective Hamiltonian corresponding to the full Hamiltonian H (x) $=H_0+xH_1$, H_0+xH_1, H_0 and H_1 being respectively the unperturbed and the interaction Hamiltonian and x being a strength parameter. The radius of convergence for the perturbation expansion is related to the poles of the energy-dependent effective interaction, and the location of these poles in the complex x-plane is discussed. The situation with poles lying off the real x-axis is examined. In terms of the spectrum of the unperturbed Hamiltonian H_0, some necessary conditions for convergence are derived, and the effects of intruder states are discussed. It is shown that the BW expansion of the ground-state energy can always be made convergent by a shift of the unperturbed energy spectrum.

45856 Annihilation widths and shifts of quasinuclear NN-bar levels in the coupled-channel model. Kerbikov, B.O.; Kudryavtsev, A.E.; Markushin, V.E.; Shapiro, I.S. (Institute of Theoretical and Experimental Physics). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 6, 368-371(20 Sep 1977).

It is shown that in the case of radius of the annihilation interaction, the annihilation widths and shifts of the quasinuclear levels (NN-bar) remain small at arbitrary annihilation intensity. At low annihilation intensity the level shift is negative: the level becomes deeper.

45857 Change in the behavior of formfactors of compound systems as high transferred momenta are approached asymptotically. Kudryavtsev, A.E.; Simonov, Y.A. (Institute for Theoretical and Experimental Physics). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1063-1067(Jun 1977).

A study is made of the behavior of the elastic formfactor F/sub N/(q) and of the matrix element for virtual decay G/sub N/(q) of a compound system of N strongly interacting particles. On the example of a one-dimensional model with a δ-like attractive potential it is shown that for an arbitrary number of components N at high transferred momenta F/sub N/ and G/sub N/ fall off as a power of the transferred momentum, with F/sub N/∼G/sub N/∼q/sup(- 2N/-1). Such a power-type fall-off corresponds completely to the quantum asymptotic behavior of the N-body problem. The exact expression for F/sub N/(q) contains N-1 pole singularities. The nature of these poles is discussed. In the domain of low transferred momenta F/sub N/ and G/sub N/ exhibit exponential fall-off with the slope of the exponent being determined by the radius of the soliton solution of the classical nonlinear equation corresponding to the quantum equation. The quasiclassical correction to the soliton formfactor is obtained. A change in the behavior of the functions F/sub N/ and G/sub N/ is observed in the region q/sub cr/$=q_0$N, where q_0 is the characteristic hadron momentum determined by the dynamics of the system and independent of the number of components. Thus, for large N the approach of the form factors to the power-law asymptotic behavior is delayed.

RELATIVITY AND GRAVITATION

45858 Geometry of superspace and local supersymmetry. Gates, S.J. Jr. (Center for Theoretical Physics, Department of Physics and Laboratory for Nuclear Science, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev., D;* **17**: No. 12, 3188-3195(15 Jun 1978).

We briefly review the theory of general relativity in superspace and show how the theory may be interpreted from the view of a superfiber bundle. It is shown that this superfiber, however, does not possess, as its structural group, the fourteen-parameter group of global supersymmetry, the super Poincare group. Starting from an ansatz which is suggested by superspace general relativity, a second superfiber bundle theory is constructed which does possess the super Poincare group as its structural group.

45859 Gauge invariance in supergravitation. Kallosh, R.E. (P. N. Lebedev Physics Institute, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 427-429(5 Oct 1977).

Starting from the gauge-invariance requirement, new Feynman rules that include four-fermion interaction of ficticious particles are constructed in the theory of supergravitation.

45860 Creation of fermion pairs by a nonstationary gravitational field. Mamaev, S.G.; Mostepanenko, V.M.; Frolov, V.M. (Leningrad Electrotechnical Institute). *Sov. J. Nucl. Phys. (Engl. Transl.);* **26**: No. 1, 111-115(Jul 1977).

General expressions are obtained for the vacuum expectations of the energy-momentum tensor of the spinor field in the presence of an external nonstationary gravitational field. A time-dependent normal ordering prescription is given which is used to cancel divergent terms due to the zero vacuum oscillations. The remaining logarithmic divergences are removed by means of the conformal-invariant procedure proposed for the scalar field in Ref. 3 [S. W. Hawking, Commun. Math. Phys. 43, 199 (1975)]. Estimates are obtained for the energy density and pressure of particles created near a homogeneous isotropic singularity.

ACOUSTICS

45861 (COO—3130TA-341) **Nonlinear sound generation by high energy particles.** Westervelt, P.J. (Brown Univ., Providence, R.I. (USA). Dept. of Physics). 1978. Contract EY-76-C-02-2130. 6p. (CONF-780453—2). Dep. NTIS, MF A01.

From Neutrinos; West Lafayette, IN, USA (28 Apr 1978). Portions of document are illegible.

In connection with Project DUMAND, the proposal to utilize the ocean as a giant acoustic detector of neutrinos, the applicability of a recent theory of thermoacoustic arrays [Peter J. Westervelt and Richard S. Larson, J. Acoust. Soc. Am. 54, 121 (1973)] is studied. In the static case or at very low frequencies, about 10% of the coefficient of thermal expansion for water at 20°C can be attributed to Debye-like modes. Debye-like modes generate sound via the nonlinear mechanism responsible for the operation of the parametric acoustic array [Peter J. Westervelt, J. Acoust. Soc. Am. 35, 535 (1963)]. The contribution of the Debye-like modes to the thermal expansion coefficient and thus to the sound pressure is essentially independent of the ambient water temperature. Hence if the Debye-like modes are not fully excited as is postulated to be the case at high frequencies, then the thermal expansion coefficient will be less than the static value by an amount that causes it to vanish at about 6°C instead of at 4°C, the temperature of maximum water density. This theory is in agreement with recent measurements of the temperature dependence of sound generated by proton deposition in water [L. Sulak, et al., Proceedings of the La Jolla Workshop on Acoustic Detection of Neutrinos, 25—29 July 1977, Scripps Institute of Oceanography, U.C.L.A., San Diego, Hugh Bradner, Ed.].

OPTICS

45862 Coherence vs. incoherence in stepwise laser excitation. Shore, B.W.; Johnson, M.A. (Lawrence Livermore Laboratory, Livermore, California 94550). *J. Chem. Phys.;* **68**: No. 12, 5631-5635(15 Jun 1978).

We demonstrate the manner in which solutions of the (coherent) Schroedinger equation for multistep excitation approach those of an (incoherent) rate equation. For a two-level system, coherence produces oscillations about the mean rate-equation values. In more general N-level sequences the two types of solutions agree in the limit described by Ackerhalt and Eberly. We point out instances in which a simple rate equation cannot duplicate results of the Schroedinger equation.

45863 Stimulated emission and absorption in classical systems. Cocke, W.J. (Steward Observatory, University of Arizona, Tucson, Arizona 85721). *Phys. Rev., A;* **17**: No. 5, 1713-1720(May 1978).

Electromagnetic radiation from a classical charge distribution interacts with an incident plane wave, and the interaction terms in the resulting Poynting vector are shown to give a net contribution to the total energy flux exactly in the forward-scattering direction. A simple relativistically valid expression for the interaction energy in the case of a single particle is derived, and we show that energy is conserved in Thomson scattering if radiation-reaction forces are

included. A perturbation theory is developed for a particle having its own given unperturbed motion, and the perturbed interaction energy is shown to be proportional to the intensity of the incident wave. We apply this theory to a "free-electron laser" consisting of a relativistic electron in a linear accelerator, and show that stimulated emission or absorption could both occur. The result contradicts that obtained using the Einstein-coefficient method.

STATISTICAL PHYSICS AND THERMODYNAMICS

45864 Theoretical analysis of heat flow in horizontal ribbon growth from a melt. Zoutendyk, J.A. (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, California 91103). *J. Appl. Phys.;* **49**: No. 7, 3927-3932(Jul 1978).

A theoretical heat flow analysis for horizontal ribbon growth is presented. Equations are derived relating pull speed, ribbon thickness, thermal gradient in the melt, and melt temperature for limiting cases of heat removal by radiation only and isothermal heat removal from the solid surface over the melt. Geometrical cross sections of the growth zone are shown to be triangular and nearly parabolic for the two respective cases. Theoretical pull speed for silicon ribbon 0.01 cm thick, where the loss of latent heat of fusion is by radiation to ambient temperature (300 K) only, is shown to be 1 cm/sec for horizontal growth extending 2 cm over the melt and with no heat conduction either to or from the melt. Further enhancement of ribbon growth rate by placing cooling blocks adjacent to the top surface is shown to be theoretically possible.

45865 Rate at which molecules strike a surface or orifice in a vacuum system. Edwards, D. Jr. (Brookhaven National Laboratory, Upton, New York 11973). *J. Vac. Sci. Technol.;* **15**: No. 3, 1182-1185(May 1978).

It is shown for a spherical vacuum chamber with system pressure in the molecular flow region, that the rate per unit area at which molecules strike a surface or orifice is, in general, not 1/4 nv/sub a/ but depends on the molecule—wall scattering function, the classical result (1/4 nv/sub a/) being obtained for a cosine wall scattering function.

MATHEMATICAL PHYSICS

45866 (LBL—7291) High order finite element method for the calculation of capillary surfaces. Brown, R.A. (Minnesota Univ., Minneapolis (USA). Dept. of Chemical Engineering and Materials Science). Dec 1977. Contract W-7405-ENG-48. 29p. Dep. NTIS, PC A03/MF A01.

A reduced quadratic finite element method on quadrilaterals is developed for discretizing the capillary equation in regular and irregular domains. Newton's method is used to solve the resulting set of nonlinear equations for the capillary surface. Numerical experiments are conducted for square and elliptical capillaries in order to compare this high-order method to a bilinear finite element-Newton scheme and a finite difference--dynamic alternating direction implicit (DADI) technique. The reduced quadratic finite element method is shown to be the most efficient in these tests due to the relatively coarse element grids that can be used for accurate approximations.

45867 Solution of a second-order integro—differential equation which occurs in laser modelocking. Hagelstein, P.L. (Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *J. Math. Phys. (N.Y.);* **19**: No. 7, 1594-1599(Jul 1978).

We solve the following integro—differential equation for the eigenfunction u (x): su (x) $=\{d^2/dx^2-[1-6\mathrm{sech}^2(x)]\}u(x)-\epsilon\int/\sup$ infinity//sub -infinity/u (x')sech(x') dx' $(1+\nu^2 d^2/dx^2)\mathrm{sech}(x)$, where s is the eigenvalue and ϵ and ν are arbitrary parameters which need not be small. This equation occurs in laser modelocking theory in the analysis of pulse stability, and s is proportional to the rate of growth of perturbations. We expand the eigenfunction u (x) in terms of a convenient basis set Λ (x,k) satisfying $-k^2\Lambda(x,k) = d^2/dx^2 + 6\mathrm{sech}^2(x)]\Lambda(x,k)$. We find two discrete eigenfunctions $u_0(x)$ and $u_1(x)$ and a continuum u (x,s). We find that the lowest eigenvalue $s_0(\epsilon)$ is -3 at $\epsilon=0$ for finite or zero ν, and that the point where $s_0=0$ the parameters ϵ and ν obey $\epsilon=2/(1-\nu^2)$. This is the zero growth point at which no eigenfunction u (x) has a positive eigenvalue s.

FUSION ENERGY

PLASMA RESEARCH

45868 Focusing resonance cones. Levine, B.; Greene, G.J.; Gould, R.W. (California Institute of Technology, Pasadena, California 91125). *Phys. Fluids;* **21**: No. 7, 1116-1119(Jul 1978).

The potential for an oscillating ring source immersed in cold, magnetized, collisionless plasma in the resonance cone regime (K/sub parallel//K/sub perpendicular/<0) is evaluated exactly and asymptotically, giving insight into the gross spatial behavior of the focusing resonance cones. The nature of the singularity in potential is clarified by the introduction of a noninfinitesimal collision frequency. Thermal effects are considered numerically, revealing an interesting interference structure in potential as well as a density depression near the focus of the cone due to the ponderomotive force.

45869 Fast hydrogen gas injection system for plasma physics experiments. Burrell, K.H. (General Atomic Company, San Diego, California 92138). *Rev. Sci. Instrum.;* **49**: No. 7, 948-954(Jul 1978).

A system has been developed for fast injection of hydrogen gas into a vacuum system, which can produce feedback controlled flows in the range 0.1—10 Torr l/s. The unit uses a fast pressure transducer as a flow sensor. The flow will respond to an external programming voltage whose time variation is as short as several milliseconds.

45870 Theoretical studies of MHD plasma molecules. I. Potential energy curves and dipole moments of linear KOH. England, W.B. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *J. Chem. Phys.;* **68**: No. 11, 4896-4900(1 Jun 1978).

Uncorrelated and correlated potential energy curves and dipole moments are reported for linear KOH. The compound is found to be ionic, K^+OH^-. Minimum energy bond lengths are R/sub KO/=4.2913 au and R/sub OH/=1.7688 au, with an estimated accuracy of 2%. The corresponding dipole moment is 3.3 au (8.46 D) with a similar accuracy estimate. This is to our knowledge the first value ever reported for the KOH dipole moment, and the large value suggests that KOH will be an effective electron scatterer in MHD plasmas.

45871 Collective ion acceleration through temporal modulation of relativistic-electron-beam energy. Faehl, R.J.; Godfrey, B.B. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev. Lett.;* **40**: No. 17, 1137-1140(24 Apr 1978).

A new method is proposed for collectively accelerating bunches of ions with an intense relativistic-electron beam. By varying the beam energy in time, acceleration of a slow Doppler-shifted cyclotron wave can be accomplished, without accompanying degradation of the beam equilibrium. Test-particle calculations employing this acceleration scheme indicate performance which is highly competitive with other collective-ion-acceleration mechanisms.

PLASMA CONFINEMENT AND HEATING

REFER ALSO TO CITATION(S) 45929

45872 (IPPJ—285) End loss reduction in linear devices by means of oscillating multiple mirrors. Grossmann, W.; Wakatani, M. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Apr 1977. 17p. Dep. NTIS (US Sales Only), PC A02/MF A01.

We consider briefly the effects of adding oscillating multiple mirrors to a linear theta-pinch like plasma column. The plasma parameters chosen for the example shown correspond to those of a previously proposed linear reactor configuration. We show that it should be easy to dynamically stabilize the inherently unstable bumpy theta-pinch which results from adding static mirrors to a linear theta-pinch. We show further that the energy in the dynamic stabilization circuit can be used for plasma heating since the oscillating field components give rise to strongly Landau damped ion-acoustic waves.

45873 (N—77-33979) End pluggings of a linear theta pinch by hot high z plasmas of high mass number. Hirano, K.I.; Wakatani, M. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1976. 19p. (IPPJ—262). NTIS PC A02/MF A01.

End plugging of a theta-pinch by high temperature plasma of high mass number is proposed. Using two different simplified models, thermal insulation mode (TIM) and free expansion mode (FXM), characteristic parameters interested in CTR reactor are calculated. The TIM claims that the energy is lost through the electron thermal conduction, whereas in the FXM the plasma energy is carried out with the plasma flowing along the magnetic field line. In the TIM the thermal insulation is improved due to the high Z number of plugging plasmas. In the FXM inertia of the high mass ions contribute to reduce the plasma expansion speed along it. A typical example of the length of the system will be 68 m for the Lawson criterion experiment under the operation of 200 kG.

45874 (N—77-33983) **Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves.** Ohsawa, Y.; Kamimura, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Nov 1976. 25p. (IPPJ—266). NTIS PC A02/MF A01.

The nonlinear behavior of ion acoustic waves with rather short wavelength was investigated by computer simulation. The nonlinear frequency shift is negative and is proportional to the square root of the initial wave amplitude when the amplitude is approximately less than 0.1. This proportionality breaks down and the frequency shift can become positive for large temperature ratios then the amplitude is approximately greater than 0.1. Nonlinear modulation of the wave packet was clearly seen; however, no modulational instability was observed. The importance of the effects of the trapped ions to these phenomena is discussed.

45875 (N—77-34004) **Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system.** Abe, H.; Kajitani, H.; Itatani, R. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jul 1977. 50p. (IPPJ—296). NTIS PC A03/MF A01.

A particle simulation model which treats the wave excitation and propagation in the nonuniform density by the external source is developed and applied for study of the lower hybrid heating in a fusion device. When the wave amplitude is large or the wave energy is about a half of the initial kinetic energy at a surface of plasma, the following features are observed for the increase of the ion and electron kinetic energies: Ion perpendicular energy distributions are approximated by the two Maxwell distributions or have the components of the high energy tail, whose parallel velocities satisfy the resonance condition. A strong increase of the parallel kinetic energy of the electron is observed near the plasma surface. These are mainly due to the trapped electrons and the collisional heating.

45876 **Axial laser heating of small-diameter theta-pinch plasmas.** Hoffman, A.L.; Lowenthal, D.D.; Crawford, E.A. (Mathematical Sciences N. W., Inc., P. O. Box 1887, Bellevue, Washington 98009). *Appl. Phys. Lett.;* **33**: No. 4, 282-284(15 Aug 1978).

Small 5-mm-diam high-density 3 x 10^{17} cm^{-3} θ-pinch plasma columns 1-m long have been heated by intense long-wavelength laser radiation (10 μ) along their entire length. Refractive beam trapping has been achieved when laser heating begins during or before the θ-pinch implosion. Plasma temperatures have been increased from under 2 eV to maximum values of between 30 and 90 eV, in agreement with a MHD laser heating code.

45877 **Trapped electron instability in tokamaks: Analytic solution of the two-dimensional eigenvalue problem.** Catto, P.J.; Tsang, K.T. (Department of Mechanical and Aerospace Sciences, University of Rochester, Rochester, New York 14627). *Phys. Fluids;* **21**: No. 8, 1381-1388(Aug 1978).

The two-dimensional eigenvalue equation for the trapped electron instability in tokamaks is solved analytically by both a perturbation technique and a more exact method of matched asymptotic expansions. The important physical effect is shown to be the radial localization of the trapped electron term caused by the difference between the pitch of the magnetic field and that of the mode. This localization results in a completely new form for the dispersion relation and does not impede magnetic shear stabilization. Coupling of neighboring rational surfaces is shown to result in an increase of only $\pi/2$ (at most) in the growth rate.

45878 **Astron stability against poloidal perturbations.** Lovelace, R.V. (Department of Applied Physics, Cornell University, Ithaca, New York 14853). *Phys. Fluids;* **21**: No. 8, 1389-1403(Aug 1978).

An energy principle and stability requirements are derived for low-frequency poloidal perturbations of an astron ion ring embedded in a dense, low-temperature plasma. The particle ring equilibrium has a general distribution function f (H, P/sub theta/), with H the Hamiltonian and P/sub theta/ the canonical momentum in the toroidal direction. The axisymmetric perturbations are treated rigorously using the Vlasov equation for the ring and the equations of ideal magnetohydrodynamics for the plasma. An explicit integration of the Vlasov equation is obtained for conditions where the particle motion is ergodic in the poloidal plane. For finite axial-length rings, a new term in the perturbation energy is found to arise from the betatron effect of the toroidal electric field perturbation. This has an explicitly stabilizing effect if (partial/partialH) f< or =0. The stabilizing effect of this term is required for, but does not guarantee, the existence of stable equilibria with conducting walls removed to large distances.

45879 **Calculations of the effects of incomplete preionization in high voltage theta pinches.** Sgro, A.G. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Fluids;* **21**: No. 8, 1410-1416(Aug 1978).

The hybrid model presented previously has been extended to include the effects of incomplete pre-ionization by the addition of a multistep ionization process. The difference between a fully pre-ionized and a weakly pre-ionized implosion is illustrated, and the predictions of the model are compared with data from high voltage θ-pinch experiments by illustrating the degree to which the computed density and magnetic field profiles agree with experiment. Due to incomplete pre-ionization, all the plasma at a point is not accelerated simultaneously by the sheath, so that the radial density profiles are broader and the peak densities are lower than in the corresponding fully pre-ionized implosion. A differential rotation of the imploding plasma column is shown to affect the implosion dynamics and radial density distribution. It is demonstrated that the withdrawal of flux from the tube during a staged theta pinch experiment may result in plasma hitting the wall and traumatizing it.

45880 **Neutral-beam divergence due to imperfect magnetic shielding.** Conrad, J.R. (Nuclear Engineering Department, University of Wisconsin, Madison, Wisconsin 53706). *J. Appl. Phys.;* **49**: No. 7, 3656-3661(Jul 1978).

The divergence of a neutral beam due to imperfect magnetic shielding of the gas-cell neutralizer is considered. Coupled kinetic equations for the ion and neutral velocity distribution functions are solved. The deflection and divergence of the neutral beam are obtained from moments of the neutral distribution function.

45881 **Classical diffusion in large-aspect toroidal plasmas.** Pao, Y. (Courant Institute of Mathematical Sciences, New York University, New York, New York 10012). *Phys. Fluids;* **21**: No. 7, 1120-1126(Jul 1978).

Time-dependent classical diffusion in large-aspect toroidal plasmas with a circular section is studied for both low-β and high-β cases. In the low-β case, both the fast and slow phases are examined and the difference between the slow phase and the quasi-stationary theory is discussed.

45882 **Computer simulation studies of strong proton rings.** Marsh, S.J.; Drobot, A.T.; Golden, J.; Kapetanakos, C.A. (Naval Research Laboratory, Washington, D. C. 20375). *Phys. Fluids;* **21**: No. 6, 1045-1052(Jun 1978).

Results are reported from a numerical simulation study on the propagation of a rotating proton pulse and the formation and trapping of the resulting strong proton ring. It is observed that the self-magnetic field has a very pronounced effect on the dynamics of such systems. In addition, it is observed that rings trapped in a magnetic mirror field are r, z stable for the entire confinement time tested of 550 nsec and suffer neither axial nor radial particle losses.

45883 **Radial ion energy measurements in a fast theta pinch.** Chiang, T.T.; DeSilva, A.W. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *Phys. Fluids;* **21**: No. 6, 1053-1062(Jun 1978).

An electrostatic retarding field energy analyzer is used to study the ion heating and thermalization of the radial ion energy in the Maryland fast theta pinch. From the time of arrival and the angle dependence of the ion peaks, those ions reflected from the piston front with twice the piston velocity and those ions carried along with the piston can be distinguished. The space- and time-resolved data are further supported by neutron measurements and hybrid code results. A number of micro-instabilities are proposed to explain the ion heating and thermalization.

45884 **Low-frequency microinstabilities in the PLT tokamak.** Mazzucato, E. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08540). *Phys. Fluids;* **21**: No. 6, 1063-1069(Jun 1978).

A turbulence with wavelengths in the range 2—0.2 cm and with a spectrum in the range of frequencies of drift waves has been observed in the PLT discharge with scattering of microwaves. The total density fluctuation was n/sub e//n-bar/sub e/≅5 x 10^{-3}—10^{-2}. It is estimated that this turbulence can cause an anomalous transport much larger than that predicted by neoclassical theory. As the PLT discharge developed a central minimum of the electron temperature, an increase in the turbulence level was observed with a very strong poloidal localization on the outside of the plasma torus.

45885 **Laser-induced desorption of impurities from the macrotor tokamak walls.** Schwirzke, F.; Oren, L.; Talmadge, S.; Taylor, R.J. (Department of Physics and Chemistry, Naval Postgraduate School, Monterey, California 93940). *Phys. Rev. Lett.:* **40**: No. 18, 1181-1184(1 May 1978).

Flash heating by a laser pulse has been used to desorb loosely bound species from a spot on the tokamak wall. Spectral analysis of the suddenly increased impurity radiation from the plasma in front of the laser-heated spot gives information on the species and the amount of impurity atoms present on the surface at a specific point in time of the tokamak discharge. Loosely bound chromium has been found on the stainless-steel surface.

45886 **Mechanism for the ω/sub p/e radiation in Tokamaks.** Hutchinson, I.H.; Molvig, K.; Yuen, S.Y. (Plasma Fusion Center and Francis Bitter National Magnet Laboratory, Massachusetts Institute

of Technology, Cambridge, Massachusetts 02139). *Phys. Rev. Lett.;* **40**: No. 16, 1091-1094(17 Apr 1978).

The emission of a narrow line of electromagnetic radiation at the central plasma frequency, observed on several Tokamaks, is explained in terms of the scattering of enhanced plasma oscillations from thermal ion acoustic fluctuations. The emission and induced absorption rates calculated for the plasma fluctuation levels expected are considerable and the radiation is self-absorbed to an effective black-body level. The frequency, power, and polarization then predicted are in agreement with the experiment.

45887 Resonant absorption of laser light by a magnetized plasma. Woo, W.; Estabrook, K.; DeGroot, J.S. (Department of Applied Science, University of California 95616). *Phys. Rev. Lett.;* **40**: No. 16, 1094-1097(17 Apr 1978).

Theory and a particle-simulation code have been used to investigate resonance absorption of obliquely incident, p-polarized laser light by a magnetized inhomogeneous plasma. The absorption is increased (decreased) by the addition of the external magnetic field with the same (opposite) sign as the angle of incidence. The theoretical results from the two-dimensional particle simulations are in excellent agreement.

45888 (UCRL-Trans—11347) **Report on radio frequency plugging research (3rd report).** Obayashi, H.; Watanabe, N.; Hatori, I. (Hitachi Ltd., Tokyo (Japan)). Mar 1978. Translation of 43rd Specialists Committee Materials, November 26, 1977. 78p. Dep. NTIS, MF A01.

Portions of document are illegible.

This report is divided into the following 8 sections: (1) chronology of RFC project and future schedule, (2) construction of RFC-XX device: chronology and present status, (3) RF plugging at the line cusp, (4) RF plugging and heating at the mirror end, (5) RF plugging of laser-produced plasmas, (6) intensity profile of rf electric field in sheet plasma, (7) stationary state of RF plugged plasma, and (8) some theoretical problems in rf plugging. Descriptions of research work are given for each section. (MOW)

45889 Ion losses from end-stoppered mirror trap. Chernin, D.P.; Rosenbluth, M.N. (Institute for Advanced Study, Princeton, N.J. (USA)). *Nucl. Fusion;* **18**: No. 1, 47-62(1978).

The loss rate of singly charged ions from an end-stoppered mirror trap is discussed by using a linearized Fokker-Planck equation and the associated variational principle. A comparison is made with the earlier work of Pastukhov and with numerical results.

45890 Numerical study of the dissipative trapped-electron instability in tokamaks. Chu, K.R. (Science Applications, Inc., McLean, Va. (USA)); Manheimer, W.M. (Naval Research Lab., Washington, D.C. (USA)). *Nucl. Fusion;* **18**: No. 1, 29-33(1978).

The dispersion relation for the dissipative trapped-electron mode including the effects of magnetic shear, finite ion Larmor radius, banana-plateau velocity space separation, magnetic curvature drift resonance, ion-ion collisions, etc. is used to examine the plasma stability of recent tokamak experiments. Regimes of importance of various effects in these experiments are also discussed. Instabilities mostly occur at ksub(theta)rhosub(i) approximately 1, where ksub(theta) is the azimuthal wave number and rhosub(i) is the ion Larmor radius. The often used anomalous heat conduction coefficient, γ/k^2sub(theta), predicts losses comparable to those observed in TFR, ST, and ATC.

45891 Empirical tokamak scaling. Hugill, J. (UKAEA Research Group, Abingdon. Culham Lab.); Sheffield, J. (JET Design Group, Culham Lab., Abingdon, United Kingdom). *Nucl. Fusion;* **18**: No. 1, 15-22(1978).

Experimental results from a large number of tokamaks have been collected. It is shown that the measured energy confinement times are consistent in the sense that they may be represented (accurately) by simple empirical formulas. These formulas are used in predicting the Ohmically heated temperatures in future tokamaks. The predicted temperatures are similar to but slightly lower than those in present machines. Tsub(e0) is about 0.5 to 1keV. This result emphasizes the point that substantial additional heating will be required for the attainment of ignition temperature.

45892 (UCRL-Trans—11356) **Injection of electron beams into mirror confined plasmas (I).** Kawabe, T.; Ishizuka, H.; Yazu, K.; Miyoshi, S.; Kojima, S. Translated from *Kakuyugo Kenkyu;* **39**: No. 2, 130-142(1978). 19p. Dep. NTIS, PC A02/MF A01.

Studies were made of the injection of electron beams into plasmas in mirror type magnetic fields, particularly in cases where there is turbulence in the plasma. The manner in which the electron beams are scattered, how they are captured by the mirror magnetic field, and the heating of the plasma were investigated. In particular, quantitative studies were made of cases where relativistic or nonrelativistic electron beams are injected into tandem mirrors. Such beams were found to be effective for heating and confinement of the mirror plasma.

45893 Dimensional estimates of the cooling time of a plasma with $\beta >> 1$. Vekshtein, G.E. (Institute of Nuclear Physics, Siberian Branch, Academy of Sciences of the USSR, Novosibirsk). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 11, 651-653(Nov 1977).

The time required for a hot homogeneous plasma confined in a cylindrical tube to lose half of its thermal energy is calculated.

45894 Self-localized electromagnetic fields in a dense gas. Alanakyan, Y.R. (Order of the Red Banner of Labor All-Union Scientific-Research Institute of Physicotechnical and Radiotechnical Measurements). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 687-691(Nov 1977).

A study is made of a plasma object in a high-pressure gas which represents a localized high-frequency electromagnetic field near which a plasma with a high electron temperature forms. The properties of the plasma are determined; the dynamic equilibrium of the object with the surrounding gas is taken into account.

45895 U. S. Mirror Fusion Program. Fowler, T.K.; Post, R.F. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 787-794(Nov 1977).

A brief review is given of the 2xIIB magnetic mirror experiments at lawrence livermore laboratory.

45896 Ion heating and fine structure of the potential in the interaction of a magnetic piston with a plasma. Koshilev, N.A.; Strokin, N.A.; Shishko, A.A. (Institute of Terrestrial Magnetism, Ionosphere, and Radiowave Propagation). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 391-394(5 Oct 1977).

We investigated experimentally ion heating and the structure of the potential following compression of a plasma ($n_0 \approx 0.7 \times 10^{12}$ — 5×10^{12} cm^{-3}) by a magnetic piston (H=1200 Oe, T/4=400 nsec) in a θ pinch without an initial magnetic field. We demonstrate the existence of broad spectra of ions moving in a radial direction and scattered through 45°. A potential discontinuity of width ~50—100 Debye lengths is formed ahead of the magnetic piston. The results do not contradict the assumption that a turbulent electrostatic shock wave exists under the conditions in question.

45897 Possible feedback suppression of the tearing-mode instability in a tokamak. Arsenin, V.V. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 524-526(Sep 1977).

The tearing mode, the excitation of which apparently initiates the disruption in a tokamak with a sharp radial current distribution, can be suppressed with a feedback system which measures the displacement of the hot, current-carrying core of the plasma and which controls a perturbation of the magnetic field outside the plasma.

45898 Plasma confinement in a purely toroidal magnetic confinement system with a self-consistent electric field. Bulyginskii, D.G.; Yuferev, V.S.; Galaktionov, E.V. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 528-532(Sep 1977).

A qualitative analysis is made of a possible mechanism for the formation of an equilibrium plasma configuration in a current-free toroidal plasma in a conducting chamber in a toroidal magnetic field. In this case the role of the rotational transform is played by the plasma rotation about the minor azimuth in the crossed fields. Sufficiently strong electric fields are automatically produced by the charge separation caused by toroidal drift or the preferential loss of particles of one species. The macroscopic force balancing the uncancelled part of the gas kinetic pressure along the major radius is the force due to the interaction of the net plasma charge with the image charge at the inner wall of the conducting chamber. Estimates show that the fields required here are not excessively strong if the polarizability of a dense plasma is taken into account. This configuration is free of "trapped" particles and the related effects.

45899 Thermonuclear reaction wave in high-density plasma. Nishihara, K. (Osaka Univ. (Japan)); Nozaki, K.; Taniuti, T.; Asano, N. *Reza Kenkyu;* **4**: No. 4, 172-190(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

The aim of the present study is to investigate the dependence of the characteristics of the thermonuclear reaction waves in high density plasma on the processes such as shock heating, electron thermal condition and α-particle conduction. The analytical investigation of the ignition condition and development of weak reaction waves and the numerical study on the propagation and structure of strong ones are presented. Weakly reacting sound waves in quasi-equilibrium high temperature plasma were considered in order to analyze the hydrodynamic motion of the plasma heated by the α-particles produced by D-T reaction. Two equations were derived,

and the ignition condition and steady-state weak reaction waves were discussed. It is shown that the initial disturbance with the wavelength longer than several fold of the α-particle range grows, and under the periodic boundary condition, it eventually reaches steady state sawtooth waves. If an initial slightly heated region is large sized in comparision with the critical wave length, the initial disturbance grows and develops to strong reaction waves. The development, propagation and structure of the strong reaction waves were numerically studied under the assumptions of spherical symmetry and homogeneously compressed plasma. It is suggested that the strong reaction waves are overcompressed detonation waves.

45900 Experiments with a relativistic electron beam injected into a plasma. Sinman, A. (Ankara Nuclear Research and Training Center (Turkey)); Hopman, H.J.; Jurgens, B. (FOM-Instituut voor Atoom-en Molecuulfysica, Amsterdam (Netherlands)). *Istanbul Univ. Fen Fak. Mecm., Seri C;* **39**: 1-17(1976).

A pulsed relativistic electron beam (550 kV, 500 A, 20 ns) is injected into a low density, rf-created, Argon plasma (nsub(p) less than or equal to $10^{12}cm^{-3}$). The return current induced in the plasma by the beam self fields amounted to approximately 400 A. By means of an electrostatic retarding field energy analyzer energetic plasma electrons with a temperature of 420 V were recorded about 150 ns after the beam pulse was over. Heating of plasma electrons was also observed with diamagnetic loops, indicating electron temperature up to 2600 V.

PLASMA DIAGNOSTICS

45901 (JAERI-M—7121) **FIR-interferometer for JT-60.** Itagaki, T.; Matoba, T.; Funahashi, A.; Suzuki, Y. (Japan Atomic Energy Research Inst., Tokyo). Jun 1977. 56p. (In Japanese). Dep. NTIS (US Sales Only), PC A04/MF A01.

A far infrared interferometric method has been studied for measuring the electron density in large tokamak JT-60 to be completed in JAERI in 1981. A far infrared laser is necessary to optimize the number of fringes and the refraction in JT-60. The maximum detectable density of plasma is limited by the refraction. Far infrared interferometry whereby electron densities are measured in medium tokamaks such as TFR and ALCATOR is first explained. The S/N values of interferometric signals are estimated in JT-60. The major noise sources are fluctuation of the far infrared laser beam, attenuation of the probe beam by refraction, synchrotron radiation and mechanical vibration. The frequency modulation method is effective for improvement of S/N values against noise sources, except the mechanical vibration. A far infrared interferometer used for JT-60 is also described.

45902 (JAERI-M—7220) **Diagnostic planning in JT-60 project.** Matoba, T.; Suzuki, Y.; Funahashi, A.; Itagaki, T. (Japan Atomic Energy Research Inst., Tokyo). Aug 1977. 17p. Dep. NTIS (US Sales Only), PC A03/MF A01.

The diagnostic plans of JT-60 were made along with design of the main machine. Basic requirements of the diagnostic program are (1) multiple measurement of respective plasma parameters, (2) efficient usage of the discharge, (3) capable data acquisition system, (4) high reliability of the diagnostic equipments, and (5) systematic development of new diagnostic techniques. Dimensions of the diagnostic ports were determined in detailed design of the vacuum vessel, anticipating the possible diagnostic methods. The proposed diagnostic systems and the plans are shown in table and figures respectively. Problems in the diagnostics are also described.

45903 (JEN—390) **Experimental device for the X-ray energetic distribution measurement in a tokamak plasma.** Perez-Navarro, A. (Junta de Energia Nuclear, Madrid (Spain)). 1977. 33p. (In Spanish). Dep. NTIS (US Sales Only), PC A03/MF A01.

An experimental system to measure the X-ray spectrum in a tokamak plasma is described, emphasizing its characteristics: resolution, dead time and the pulse pile-up distortion effects on the X-ray spectra.

45904 (N—77-33495) **Photographic study of rapid events by picosecond techniques.** Vollrath, K.; Hugenschmidt, M. (Institut Franco-Allemand de Recherches de Saint-Louis, 68 (France)). 13 Sep 1976. 9p. (ISL-CO—214/76). NTIS PC A02/MF A01.

Former studies of high-speed events, e.g., spark formation and laser produced plasmas by nanosec light pulses, revealed the necessity of shorter exposure times. This can be done using picosec light pulses, either a single one or a train of pulses, generated in the cavity of a mode-locked neodymium or a ruby laser. Schlieren photos of laser triggered open-air sparks taken by multiple exposure with a series of pulses from a neodymium laser show the advantages of these techniques compared to one-dimensional streak photographs. As another example, photos of a plasma induced by a series of ps-light-pulses on a metal surface are shown. The application of single-pulse techniques is demonstrated by the study of a laser spark, induced by one or two ps pulses in air. To get sufficient power for a breakdown, the single pulse extracted from the mode-locked laser passes a two-stage ruby amplifier. After focalization, the main part of the pulse energy produces the breakdown. The remaining part of the pulse passes a variable optical delay system and serves as a light source for a schlieren system. In this way, single-shot schlieren photos of laser sparks with life times less than one nanosec are obtained. For the study of later stages in spark development multiple exposure by a train of pulses is used. The above mentioned experimental arrangements are discussed in detail, the measurement of pulse duration by TPF and image converter is described, and some results as regards plasma behavior are presented.

45905 (PPPL—1440) **Lower limits for parallel impurity fluxes in the PLT edge plasma.** Cohen, S.A.; Dylla, H.F. (Princeton Univ., N.J. (USA). Plasma Physics Lab.). May 1978. Contract EY-76-C-02-3073. 23p. Dep. NTIS, PC A02/MF A01.

Lower limits for time-resolved anti B-parallel impurity fluxes to solid collectors immersed in the PLT edge plasma have been determined as a function of minor radius. Using geometric shadowing of the probe surface, features attributed to finite ion gyroradii have been observed. Also, for r less than 48 cm, heat pulses of less than 2 ms duration and greater than 2.5×10^3 W/cm² intensity were found to occur at the termination of many discharges.

45906 Tamper temperature and compression from simultaneous proton and alpha-particle measurements in laser fusion experiments. Cover, R.A.; Kubis, J.J.; Mayer, F.J.; Slater, D.C. (KMS Fusion, Inc., P.O. Box 1567, Ann Arbor, Michigan 48106). *Appl. Phys. Lett.;* **33**: No. 3, 222-224(1 Aug 1978).

The energy loss per unit path length for a charged particle incident on a spatially uniform isothermal Maxwellian plasma is a function of the temperature and density of the medium. Within this model the temperature and compression rhoΔr of the tamper of a laser-driven microshell target can be accurately determined, in the absence of electrostatic acceleration, by the simultaneous measurement of the energy loss from 3.52-MeV α particles from D-T reactions and 3.02-MeV protons from D-D reactions.

45907 Far-ir heterodyne radiometric measurements with quasioptical Schottky diode mixers. Fetterman, H.R.; Tannenwald, P.E.; Clifton, B.J.; Parker, C.D.; Fitzgerald, W.D.; Erickson, N.R. (Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Massachusetts 02173). *Appl. Phys. Lett.;* **33**: No. 2, 151-154(15 Jul 1978).

We have made heterodyne radiometric measurements with GaAs Schottky diode mixers, mounted in a corner-reflector configuration, over the spectral range 170 μm to 1 mm. At 400 μm, system noise temperatures of 9700 K DSB (NEP=1.4 x 10⁻19 W/Hz) and mixer noise temperatures of 5900 K have been achieved. This same quasioptical mixer has also been used to generate 10⁻7 W of tunable radiation suitable for spectroscopic applications.

45908 Plasma x-ray emission produced by ruby lasers at 10^12 W/cm². Bleach, R.D.; Nagel, D.J. (Naval Research Laboratory, Washington, D.C. 20375). *J. Appl. Phys.;* **49**: No. 7, 3832-3841(Jul 1978).

Q-switched 20-nsec ruby-laser pulses (~0.5 GW) were focused to about 10^12 W/cm² on targets containing elements in the range 6< or =Z< or =68. Time- and space-integrated x-ray emission from plasmas 200 μm in diameter with lifetimes near 12 nsec was measured with four active detectors at energies between 0.1 and 5 keV. Maxima in x-ray intensity measured by each detector occurred when binding energies of core electrons in target atoms were 20—30 times the electron plasma temperature. Calculated detector response functions together with coronal-model plasma emission computations were used to analyze the atomic-number dependence of the detector signals. A plasma electron temperature of 70 eV and an electron density of about 4×10^20 cm⁻3 gave the best fit to the ratios of signals. Computed spectra for this temperature showed that the peaks in the low-energy detector (an x-ray diode most sensitive near 0.15 keV) were due in part to line radiation. Peaks in the three detectors sensitive above 1 keV (two silicon PIN diodes and an ionization chamber) were primarily due to recombination radiation. The results of this work augment an earlier similar, but limited, study at 10^12 W/cm².

45909 Energy-transport experiments in 10-μm laser-produced plasmas. Mitchell, K.B.; Godwin, R.P. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Appl. Phys.;* **49**: No. 7, 3851-3854(Jul 1978).

X-ray experiments were conducted giving data on radiation and electron transport from plasmas produced by the interaction of 10.6-μm laser light focused on layered targets. The targets employed were evaporated aluminum on SiO_2 and copper substrates. The penetration depth of the plasma was measured from the thickness of aluminum required to produce a 1/e attenuation of the highly ionized silicon lines ($1s\ 2p\text{-}1s^2$) and ($1s\ 3p\text{-}1s^2$). The penetration of the plasma into the target surface was 95 A for incident 10.6-μm laser irradiances of 3×10^13 W/cm². Estimates of electron energies

produced in the plasma directed toward the target were made from measurements of the attenuation of the K line of the substrate as a function of aluminum thickness. End-point electron energies were calculated from the best fit of experimental data with targets of SiO_2 and copper substrates for laser irradiances from 3 x 10^{13} to 4 x 10^{14} W/cm^2. When the laser irradiance (I/sub L/) is increased, there is an increased dependence of electron energies absorbed by the target. For irradiances greater than 10^{14} W/cm^2 the effective end-point energy is proportional to I/sup 1/2//sub L/.

45910 Dual laser interferometer for plasma density measurements on large tokamaks. Baker, D.R.; Lee, S. (General Atomic Company, San Diego, California 92138). *Rev. Sci. Instrum.;* **49**: No. 7, 919-922(Jul 1978).

A two-wavelength plasma density interferometer utilizing a CO_2 laser and an HeNe laser is described. The interferometer is being designed for use on Doublet III, a large noncircular cross-section tokamak. The use of the two wavelengths allows the distinction between fringe shifts due to plasma density and fringe shifts due to mirror vibrations. Plasma density fringe shifts of 1/10 of a fringe shift can be measured in the presence of mirror vibrations which cause several fringe shifts. A simple digital phase comparing electronic system is used.

45911 Characterization of a laser-produced negative-hydrogen-ion plasma. Gekelman, W.; Vanek, V.; Wong, A.Y. (TRW Systems Group, Rendondo Beach, California 90278). *J. Appl. Phys.;* **49**: No. 6, 3049-3058(Jun 1978).

The parameters of a plasma produced by irradiation of alkali hydride targets with a ruby-laser pulse are experimentally measured. Positive- and negative-ion abundances are determined with a quadrupole mass analyzer. Electron temperature was measured with rapidly swept Langmuir probes. Negative (H^-) ion temperature was obtained using the mass analyzer and focusing grids. The electron density near the target was determined by optical holography. The quantity of negative ions produced per laser pulse make the source attractive for the future development of high-energy neutral-beam systems.

45912 Energetic ion mass analysis using a radio-frequency quadrupole filter. Medley, S.S. (Fusion Research Center, The University of Texas at Austin, Austin, Texas 78712). *Rev. Sci. Instrum.;* **49**: No. 6, 698-706(Jun 1978).

In conventional applications of the radio-frequency quadrupole mass analyzer, the ion injection energy is usually limited to less than the order of 100 eV due to constraints on the dimensions and power supply of the device. However, requirements often arise, for example in fusion plasma ion diagnostics, for mass analysis of much more energetic ions. A technique easily adaptable to any conventional quadrupole analyzer which circumvents the limitation on injection energy is documented in this paper. Briefly, a retarding potential applied to the pole assembly is shown to facilitate mass analysis of multikiloelectron volt ions without altering the salient characteristics of either the quadrupole filter or the ion beam.

45913 Cornell Thomson scattering system. Sethian, J.D.; Ekdahl, C.A. (Laboratory of Plasma Studies, Cornell University, Ithaca, New York 14850). *Rev. Sci. Instrum.;* **49**: No. 6, 729-735(Jun 1978).

A Thomson scattering system has been designed and constructed for probing a relativistic electron beam heated plasma. Ruby laser light scattered through 90° is resolved by a polychromator and detected by one of six photomultipliers. The system is capable of resolving electron temperatures of 150 eV at densities of n/sub e/ $<10^{13}$ cm^{-3} with a 4-J ruby laser and an f/9 throughput collection system. Scaling to a 10-J, f/5 system would allow resolving densities of approximately 10^{12} cm^{-3}. System design, calibration, alignment, and data reduction are discussed. At elevated temperatures (T/sub e/$\cong$600 eV) evidence of the relativistic blue shift was observed.

45914 Studies of spontaneous magnetic fields in laser-produced plasmas by faraday rotation. Stamper, J.A.; McLean, E.A.; Ripin, B.H. (Naval Research Laboratory, Washington, D. C. 20375). *Phys. Rev. Lett.;* **40**: No. 18, 1177-1181(1 May 1978).

An extensive study has been made of the large magnetic fields in the plasma near the focus of a high-irradiance Nd-laser beam. The dependence of the magnetic field on many experimental conditions is noted—particularly timing and the presence of a preformed plasma. The data were obtained with a Raman-shifted, three-channel Faraday-rotation diagnositc system.

45915 Time evolution of the electron temperature in a laser-produced carbon plasma. Kas'yanov, Y.S.; Chevokin, V.K.; Shevel'ko, A.P.; Shchelev, M.Y. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 476-477(Nov 1977).

A high time resolution plasma diagnostic method is reported using an electron-optical camera with a scintillator at its input.

45916 Observation of x-ray spectra of chromium and iron in the plasma of the "tokamak-10". Aglitskii, E.V.; Rantsev-Kartinov, V.A.; Stepanenko, M.M.; Shcheglov, D.A. (I. V. Kurchatov Institute of Atomic Energy). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 401-403(5 Oct 1977).

The T-10 installation was used to obtain the x-ray spectra of highly ionized Fe and Cr atoms, with an energy resolution 20 eV. The plasma parameters were n/sub e/(0) ~7 x 10^{13} cm^{-3} and T/sub e/(0) ~1.2 keV. The chromium admixture estimated from the analysis of the spectrum is n/sub Cr/=10^{10} cm^{-3}.

45917 Use of the method of resonance fluorescence with a dye laser for plasma diagnostics in the FT-1 tokamak installation. Burakov, V.S.; Misyakov, P.Y.; Naumenko, P.A.; Nechaev, S.V.; Razdobarin, G.T.; Semenov, V.V.; Sokolova, L.V.; Folomkin, I.P. (Institute of Physics, Belorussian Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 403-406(5 Oct 1977).

Resonance fluorescence on the H/sub b/ line was used for local measurements of the concentration of neutral hydrogen atoms in the plasma of the FT-1 tokamak installation. The hydrogen-atom concentration on the discharge axis at the maxima of the current was lower than 10^9 cm^{-3}.

45918 Ultrahigh speed diagnostics of the parameters of laser plasma corona. Bychenkov, V.Y.; Zakhorenkov, Y.A.; Krokhin, O.N.; Rupasov, A.A.; Silin, V.P.; Sklizkov, G.V.; Starodub, A.N.; Tikhonchuk, V.T.; Shikanov, A.S. (P. N. Lebedev Physics Institute, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 6, 364-367(20 Sep 1977).

A method is proposed for the diagnostics of the local temperature and velocity of a laser plasma by determining the spectral characteristics of the harmonics of the heating radiation.

45919 Reconstruction of the distribution function of a plasma microfield from the H/sub β/ line profile. Bulyshev, A.E.; Preobrazhenskii, N.G. *Opt. Spectrosc. (USSR) (Engl. Transl.);* **43**: No. 3, 331-333(Sep 1977).

An algorithm is developed for calculating the Balmer line profile in a equilibrium plasma.(AIP)

45920 Measurement of the properties of a weakly ionized plasma with an electrostatic probe in a magnetic field. 1. Charged-particle density. Zhilinskii, A.P.; Kuteev, B.V.; Sakharov, N.V.; Smirnov, A.S. (M. I. Kalinin Polytechnical Institute, Leningrad). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 568-573(Sep 1977).

The effect of a magnetic field H on the electron and ion saturation currents of a single plane electrostatic probe is studied experimentally in decaying argon and helium plasmas. The characteristic dimensions of the probe are r/sub p/~10^{-2}cm. The probe is oriented in the direction perpendicular to the lines of force of H. The plasma density (n=10^7—10^{11}cm^{-3} is measured independently by a resonator method and by a short-circuiting method. It is found that the magnetic field strongly affects the ion current in the case in which the ions are magnitized, $\Omega\tau$/sub i/>1, even in the case of a large ion gyroradius (rho/sub i/>>r/sub p/). In a weak magnetic field, ($\Omega\tau$)/sub i/<1, with an ion mean free path larger than r/sub p/, the behavior of the ion current as a function of the density is described well by the collisionless theory of Lam. Measurements of the electron current over a broad range of plasma properties with and without instabilities show that the electron transport near the probe (r/sub p/$\alpha$$10^{-2}$cm remains collisional upon the appearance of oscillations and with a simultaneous sharp increase in the effective transverse-diffusion coefficient over the characteristic dimensions of the device (a~1cm). Under all conditions, the electron saturation current is approximately equal to that calculated from the Bohm theory under the assumption of classical longitudinal and transverse diffusion. Possible reasons for the weak effect of the instability on the electron saturation current are discussed.

45921 Electrostatic-probe diagnostics of a weakly ionized plasma in a magnetic field. II. Voronov, V.M.; Zhilinskii, A.P.; Kuteev, B.V. (M. I. Kalinin Polytechnical Institute, Leningrad). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 573-577(Sep 1977).

An experimental study has been made of the transient characteristics of an electrostatic probe in a decaying plasma in a magnetic field. An approximate analytic description is found for the diffusion stage of the relaxation of the probe current after a rapid switch from the ion branch to the electron branch of the probe characteristic. It is shown that the probe technique is suitable for measuring a low electron temperature (~300°K in a strong magnetic field (rho/sub e/very-much-less-thanr/sub p/) with satisfactory accuracy. The sources of errors are discussed.

45922 Method for determining plasma properties from light absorption. Burakov, V.S.; Stavrov, A.A. (Institute of Physics, Academy of Sciences of the Belorussian SSR). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 629-631(Sep 1977).

A method has been developed for determining the electron density and temperature in a low-temperature plasma from the ratio of optical densities at two frequencies in the continuum. The method has been tested with the plasma of a dc are enriched with sodium atoms and with a lithium plasma produced in the destruction of a target by a ruby laser in regular operation. The plasma was probed with the beam from a helium—neon laser in the visible and IR region. The time evolution of the plasma properties under study was found for a plasma in the quasisteady state.

45923 Diagnostics of beams of accelerated (runaway) electrons in tokamaks. Morozov, V.M. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 632(Sep 1977).

It is pointed out that diagnostic information on runaway electrons can be obtained by studying the dissociation reacation d (e,e') np.

45924 Plasma diagnostic by the "two-beam" method. Zhukovskii, V.G. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 633-638(Sep 1977).

A method is proposed for local measurements of the time and space distribution of the plasma density, n/sub e/(r,t), and the magnitude and direction of the poloidal magnetic field, B/sub p/(r, t). The method can also yield information about the dynamics of impurities over space and time. The method is based on the nonlinear interaction of two beams of submillimeter waves, ω_1,k_1 and ω_2, k_2, which intersect in some region in the plasma and excite electrostatic waves ω_3, k_3. One of the beams has a high power, while the other: the measuring beam: has a low power. The occurrence of the beam nonlinear interaction is inferred from the pumping of power from the intense beam to the measuring beam at the time at which the resonant conditions $\omega_3=\omega_1$: $\omega_2(t),k_3=k_1$: k_2 are satisfied. The plasma properties are determined from two equations: the dispersion relation and an equation describing the increase in the power level of the measuring beam. To find the time evolution of the measured plasma properties over the range of interest here, $10^13cm^-3<$ or $\approx$n/sub e/< or $\approx10^14cm^-3$, T/sub e/< or $\approx$1keV, B/sub O/ =35kg, it is suggested that a maser be used as the power oscillator, while a backward-wave tube be used in the measuring channel. This backward-wave tube should have a linearly tunable frequency during the pulses from the power oscillator. Analysis shows that a signal-to-noise ratio larger than unity can be achieved in the measurement channel if use is made of the important difference between the useful signal and everything else (the noise) in terms of frequency spectra and if the properties are measured very accurately (within~10%—20%)d, if the power changes can be measured within an error of the order of a few percent, and if the beam divergence can be measured within < or $\approx10^-2$rad.

45925 Plasma space potential. Volkova, L.M.; Devyatov, A.M.; Sherif, M.A. (M. V. Lomonosov Moscow State University). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 641-643(Sep 1977).

A method of calculating the plasma space potential is suggested based on the inflection points in the curves of the logarithm of the electron density.

45926 Probe diagnostics of a low-temperature plasma in a magnetic field. I. Experimental procedure and determination of the plasma density. Baksht, F.G.; Dyuzhev, G.A.; Tsirkel', B.I.; Shkol'nik, S.M.; Yur'ev, V.G.; Antonov, S.V.; Vainberg, L.I.; Kazanets, G.I. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. Phys. - Tech. Phys. (Engl. Transl.);* **22**: No. 8, 940-943(Aug 1977).

The performance of an electrostatic probe in a magnetic field in a cesium plasma is studied under varying external conditions. (AIP)

45927 Probe diagnostics of a low-temperature plasma in a magnetic field. II. Determination of the electron temperature and the plasma potential. Baksht, F.G.; Dyuzhev, G.A.; Tsirkel', B.I.; Shkol'nik, S.M.; Yur'ev, V.G.; Antonov, S.V.; Vainberg, L.I.; Kazanets, G.I. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. Phys. - Tech. Phys. (Engl. Transl.);* **22**: No. 8, 944-950(Aug 1977).

The transition region of the probe characteristic in plasmas with various degrees of ionization in a magnetic field is studied experimentally and theoretically. In moderately strong magnetic fields, the standard method of determining the electron temperature from the probe characteristic can be used. When the plasma potential is determined from the floating probe potential the dependence of the voltage drop across the probe sheath on magnetic field must be taken into account.

45928 Effect of collisions on the intensities of the dielectron satellites of resonance lines of hydrogenlike ions. Vinogradov, A.V.; Skobelev, I.Y.; Yukov, E.A. (P. N. Lebedev Physics Institute, USSR Academy of Sciences). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 925-928(May 1977).

An explanation is offered for the anomalously high intensity, observed in a laser plasma, of the x-ray lines corresponding to the $2p^23P$-$1s2p^3P$ transition in multiply charged He-like ions. It is shown that in a plasma with N/sub e/$>10^{20}$ cm^{-3} the population of the $2p^23P$ levels is due to excitation by electron impact from the autoionization level $2s2p^3P$. The dependence of the intensity of these lines on N/sub e/ can be profitably used to determine plasma density, since there is no radiation capture in the case of dielectric satellites.

45929 Suprathermal electrons in a laser-heated plasma: a theoretical temperature relationship. Stroscio, M.A. (Univ. of California, Los Alamos, NM). *Opt. Commun.;* **21**: No. 2, 267-271(May 1977).

It is shown that the detection of 511 keV photons provides a simple and direct method for relating the total number of suprathermal electrons in a laser-heated plasma to the temperature of the suprathermal electrons. Furthermore, it is shown that this method clearly differentiates between the thermal and suprathermal electron populations in contrast to x-ray methods. An explicit relationship between the number of suprathermal electrons, the suprathermal temperature, and the number of 500 keV photons is derived.

45930 CO_2 laser-plasma interaction studies at NRC-Canada. Richardson, M.C.; Burnett, N.H.; Baldis, H.A.; Enright, G.D.; Fedosejevs, R.; Isenor, N.R.; Tomov, I.V. (National Research Council of Canada, Ottawa). pp 161-180 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

The principal characteristics and present output performance of the COCO-II, high power two beam 0.1 TW, CO_2 system is described. In addition an overall view of the diagnostics being developed to analyze laser-plasmas is given. These include infrared backscattered light analysis with high temporal and spectral resolution, multichannel picosecond interferometry, x-ray spectral diagnostics, and ion spectrometry.

PLASMA KINETICS - GENERAL

45931 Waves and instabilities in plasmas. Report on the fusion aspects of the third international congress, Palaiseau, France, 27 June - 1 July 1977. Cordey, J.G. (UKAEA Research Group, Abingdon. Culham Lab.). *Nucl. Fusion;* **18**: No. 3, 437-439(1978).

Results of the last two years experiments and theoretical studies devoted to magnetically confined plasmas are reviewed.

45932 Neutron yield enhancement in a CO_2 laser irradiated plasma focus. Thein, A.; Kitagawa, Y.; Takahashi, R.; Yamada, Y.; Yokoyama, M. (Osaka Univ. (Japan)). *J. Phys. Soc. Jpn.;* **42**: No. 5, 1793-1794(May 1977).

PLASMA KINETICS - EXPERIMENTAL

45933 (AD-A—048753) **Intense focussed ion beams and their interaction with matter. Interim report.** Mosher, D.; Cooperstein, G.; Stephanakis, S.J.; Goldstein, S.A.; Colombant, D.G. (Naval Research Lab., Washington, D.C. (USA)). Nov 1977. 27p. (NRL-MR—3658). NTIS PC A03/MF A01.

Recent experiments and theory dealing with the production, focussing, and interaction with matter of ion beams extracted from pinched-beam diodes is reviewed. Present experiments indicate that in excess of 300 kA of .8 MeV protons can be extracted from flat anode structures while deuterons can be focussed to about 70 kAsq.cm over 2 sq.cm target areas in a focussing geometry. (Author)

45934 (N—77-33998) **Study on rf voltage breakdown for LHRH in 0.8 to 0.9 GHz.** Ohkubo, K.; Matsuura, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1977. 29p. (IPPJ-J—27). NTIS PC A03/MF A01.

Radio frequency breakdown in the frequency range of 0.8 to 0.9 GHz was investigated in a re-entrant type resonator and in a partially concave waveguide. Characteristics of the breakdown are significantly dependent on the uniformity of the RF field as well as the presence of initial electrons, but independent of the filling pressure of hydrogen gas below .001 torr. The mechanism of breakdown is mainly reduced to the secondary electron resonance breakdown.

45935 (PPPL—1430) **Rapid scanning of spatial distribution of spectral line intensities in PLT tokamak.** Suckewer, S.; Hinnov, E.; Schivell, J. (Princeton Univ., N.J. (USA). Plasma Physics Lab.). Mar 1978. Contract EY-76-C-02-3073. 23p. (CONF-780318—1). Dep. NTIS, PC A02/MF A01.

From 2. conference on high-temperature plasma diagnostics; Santa Fe, NM, USA (1 Mar 1978).

A rotating mirror system has been constructed to allow repeated scanning during the discharge, in either poloidal (vertical) or toroidal (horizontal) direction, of selected spectral lines in PLT discharges. The maximum repetition rate for a poloidal scan is about 2 msec. The wavelength range, 2000 to 7000 A, is presently being increased to include the Schumann region, 1200 to 2000 A. Observations of radial profiles in the lines of HI, HeI, HeII, CIII, CV, OII and OV have revealed a number of curious asymmetries, which often change in the time during the discharge, as well as with change of plasma conditions, e.g., a change of aperture limiters from tungsten to carbon. The asymmetries tend to be more pronounced for the lower states of ionization, i.e., closer to the plasma periphery, and they are particularly strong near the times of disruptions caused by plasma instabilities.

45936 Collimated soft X-rays from the plasma focus. Herziger, G.; Kromholz, H.; Michel, L.; Schoenbach, K. (Technische Hochschule Darmstadt (Germany, F.R.)). *Phys. Lett., A;* **64**: No. 4, 390-392(9 Jan 1978).

Highly anisotropic soft X-ray emission with a quantum energy of approximately 1 keV has been observed at a plasma focus device. Typical beam divergence is 50 mrad as confirmed by different experimental methods.

45937 Free-expansion experiment on ATC. Grisham, L.R.; Bol, K. (Princeton Univ., N.J. (USA). Plasma Physics Lab.); Hogan, J.T. (Oak Ridge National Lab., Tenn. (USA)). *Nucl. Fusion;* **18**: No. 3, 315-326(1978).

The transport of a tokamak plasma freed from contact with a material limiter is studied. A small compression in major radius of the plasma in the ATC tokamak produces a free-standing discharge, similar, except for scale, to a possible configuration of the Tokamak Fusion Test Reactor. The density evolution is readily modelled by a numerical transport model calculation. The experiment provides a successful preliminary test of the feasibility of this technique.

45938 Behavior of superthermal electrons in the scrape-off layer of DIVA. Yamamoto, S.; Sengoku, S.; Kimura, H.; Shimomura, Y.; Maeda, H.; Ohtsuka, H.; Odajima, K.; Nagami, M.; Ueda, N. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). *Nucl. Fusion;* **18**: No. 2, 205-213(1978).

Superthermal electrons are observed in the scrape-off layer of DIVA. The superthermal electrons discussed in this paper are divided into two groups, high-energy electrons (10keV-100keV) and epithermal electrons (150eV-500eV). The epithermal electrons are studied quantitatively and their loss is shown to be explained by the destruction of magnetic surfaces near the separatrix owing to non-axisymmetric perturbations. The two-dimensional path of the high-energy electrons is studied, and the effects of non-axisymmetric perturbations on the drift surface are discussed.

45939 Effect of alternating electric fields on the diffusion of collisionless plasma in the Saturn stellarator. Voitsenya, V.S.; Voloshko, A.Y.; Kalinichenko, S.S.; Solodovchenko, S.I.; Shtan', A.F. (Physicotechnical Institute, Khar'kov). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 659-662(Nov 1977).

The effect of alternating electric fields on the confinement of a collisionless plasma is studied in a toroidal l=3 stellarator. Radio-frequency fields with an adjustable spectrum spanning the frequency range corresponding to the bounce frequency of trapped reflection of localized electrons, f/sub b/≅0.2—1.2 MHz, are excited in an injected plasma of density n∼ (1-5) x10^9 cm^{-3} with an electron temperature T/sub e/≅5 eV. It is found experimentally that the plasma confinement time under superbanana-diffusion conditions can be raised 20—40% through the appropriate choice of the frequency range of the low—level longitudinal rf fields which are excited. At intermediate electron-collision frequencies (the "plateau" region), the rf fields do not affect the confinement. When monochromatic electric fields are excited in the plasma, there is again no substantial effect on the superbanana diffusion.

45940 Return-current amplification in the interaction of an intense relativistic electron beam with a gas target. Gosteva, T.S.; Dubovoi, L.V.; Zablotskaya, G.R.; Ivanov, B.A.; Chernobrovin, V.I. (D. V. Efromov Scientific-Research Institute of Electrophysical Apparatus, Leningrad). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 701-702(Nov 1977).

Experiments are reported on the injection of a 1.5-MeV, 50-kA ($\lambda/\pi <$ or ≈ 1), 20-nsec electron beam into a neutral gas. Under certain conditions, the amplitude of the return current induced by the primary electron beam in the plasma produced in the gas by this beam is higher than the amplitude of the beam current by a factor of 2—3 (this is return-current amplification). On the other hand, a simple model for the excitation of the return current, I_2, during the propagation of a pulsed relativistic electron beam with a current I_1 in a finite-conductivity plasma predicts that I_2 would be smaller than or equal to I_1.

45941 Instability enhanced emissions of x-ray and neutron in plasma focus. Thein, A.; Kitagawa, Y.; Takahashi, R.; Yokoyama, M. (Osaka Univ. (Japan)). *Jpn. J. Appl. Phys.;* **16**: No. 6, 1009-1014(Jun 1977).

In the dense plasma focus, instability such as ion acoustic wave instability, is excited at the focus pinch. With the observation of such oscillation in the discharge current, the emissions of X-rays and neutrons are enhanced. An X-ray measurement shows that electrons are heated up to 10.5 keV. The neutron yield (D-D) is also enhanced with the increase of the instability amplitude. The ion temperature of 2.1 keV is obtained from the velocity distribution of the neutrons.

45942 Measurements of the ion energy spectrum in a collisionless neutral current sheet. Koshilev, N.A.; Masalov, V.L.; Strokin, N.A.; Shishko, A.A. (Institute of Terrestrial Magnetism, Ionosphere, and Radiowave Propagation, Siberian Division, USSR Academy of Sciences). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1108-1113(Jun 1977).

A multichannel electrostatic energy analyzer has been used with a θ-pinch installation with a reverse field to determine the ion energy distribution in the radial and longitudinal directions in the plasma. A well-defined beam of ions reflected elastically from the sheet propagates in the radial direction ahead of the neutral sheet. The ion temperature in the sheet does not exceed 60—80 eV. The ion flux along the neutral sheet consists of ions scattered out of the radial flux and ions accelerated across the boundary between the hot and cold plasma.

45943 Scattering and energy broadening of an electron beam in a plasma. Amemiya, H. (Institute of Physical and Chemical Research, Wako, Saitama (Japan)). *J. Phys. Soc. Jpn.;* **42**: No. 5, 1707-1714(May 1977).

The behavior of the primary electron beam due to interaction with a plasma and neutral atoms are studied experimentally by injecting an electron beam into a plasma with parameters of beam energy, beam and plasma densities. The energy spectrum of the beam, initially having a sharp energy spectrum, broadens toward higher and lower energies along the direction of beam flow as an increasing function of the above variables under the influence of waves excited. The intensity and, especially, the frequency of these waves are important factors for the energy broadening, since an externally applied wave causes a marked change in the energy spectrum of the beam when its frequency is near that of the excited waves and its amplitude is above a certain value. Besides collision with gas atoms, the fluctuations are found to be responsible for the spatial scattering of the beam. Due to the variation of the beam energy distribution function, the waves with a broad spectrum near the plasma frequency set in saturation at a relatively short distance from the gun. In the above nonlinear system, the naturally excited waves are totally suppressed by an external wave.

45944 Plasma acceleration by means of microwave radiation pressure. Fukumura, T.; Takamoto, T. (Kansai Univ., Suita, Osaka (Japan). Faculty of Engineering). *Denki Gakkai Ronbunshi, A;* **97**: No. 3, 149-155(Mar 1977). (In Japanese).

In the electric discharge of gas with microwaves, intense reflection waves occur simultaneously with the discharge, so the plasma ionized and formed by the microwaves is accelerated due to large radiation pressure. The basic experiment made, aiming at plasma gun, is described. In the gas electric discharge, the plasma flow velocity proportional to the reflected power is obtained. For 550 W microwave input power, the plasma velocity of 1 x 10^4 m/s was obtained. The accelerated plasma is bunched; its front as mass travels, recombines and disappears.

PLASMA KINETICS - THEORETICAL

45945 (N—77-33978) Equilibrium of REB-ring with soft-core. Ikuta, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1976. 13p. (IPPJ—260). NTIS PC A02/MF A01.

A equilibrium configuration of a charge-neutralized toroidal relativistic electron beam (REB ring) with a current-carrying plasma column to provide the toroidal field is calculated analytically. This plasma column is called soft-core. There exists an equilibrium of REB ring with a stable soft-core provided that the length of the core is shorter than a critical length.

45946 (N—77-33984) Diffusion of a multi-ion species plasma due to drift wave fluctuations. Tange, T.; Itoh, K.; Inoue, S.; Nishikawa, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Dec 1976. 33p. (IPPJ—267). NTIS PC A02/MF A01.

A general theory is presented for the diffusion of a multi-ion species plasma across magnetic field due to electrostatic fluctuations. The theory is based on the weak turbulence theory for an isothermal

plasma in a slab geometry. The diffusion flux due to wave-particle interactions was shown to be not necessarily proportional to the density gradient of the particle species of interest. The result is applied to the impurity diffusion due to those drift waves which exist in a single ion-species plasma. The dominant nonlinear effect is the scattering of waves on ions and the resulting diffusion constant of the host ions is derived. The impurity diffusion constant is positive (or negative) if the impurity Larmour radius is smaller (or greater) than the host-ion Larmour radius, and becomes greater than the host diffusion constant if the spectrum is localized in the unstable region.

45947 (N—77-33986) **Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma.** Sakai, K.; Aono, O. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Dec 1976. 24p. (IPPJ—269). NTIS PC A02/MF A01.

Transport coefficients concerning the diffusion and the thermal conduction across a strong magnetic field are calculated in the presence of the deuteron-triton fusion reaction on the basis of the gas kinetic theory. When the reaction takes place, the diffusion increases and the thermal conduction decreases. Effects of the reaction exceed those of the Coulomb collision as the temperature is high enough.

45948 (N—77-33987) **Helically symmetric equilibrium of current-carrying finite beta plasma.** Fujiwara, M.; Hamada, Y.; Fujiwara, M.; Miyamoto, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Dec 1976. 16p. (IPPJ—270). NTIS PC A02/MF A01.

The magnetohydrodynamic equilibrium equation of a helically symmetric system was used to determine the equilibrium characteristics of a longitudinal current-carrying finite beta plasma. Analytical expression of the rotational transform angle indicates that the contribution due to the helical component of the plasma current should be taken into account in addition to the rotational transform angle due to the external helical current and the longitudinal plasma current.

45949 (N—77-33994) **Real-space quasilinear theory of drift in a sheared magnetic field.** Hatori, T.; Lee, Y.C.; Tange, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Feb 1977. 21p. (IPPJ—279). NTIS PC A02/MF A01.

A real-space quasilinear theory is developed for the collisional and the collisionless drift waves in a plasma with a sheared magnetic field of slab geometry. The equation obtained describes the interaction between many localized modes around different rational surfaces through the density modulation of the energy source region of each mode. The wave amplitudes approach to the stationary values through a relaxation oscillation process. When the widths of the energy source region becomes comparable to the spacing of the two adjacent rational surfaces, diffusion coefficient due to the wave is enhanced over the classical value, while the nonlocal heat transport due to the wave propagation is shown to be negligible compared to that associated with the diffusion process.

45950 (N—77-33996) **Nonlinear heat and particle transport due to collisional drift waves.** Nishi-kawa, K.I.; Hatori, T.; Terashima, Y. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1977. 33p. (IPPJ—281). NTIS PC A03/MF A01.

The nonlinear evolution of unstable modes which govern transport processes in magnetically confined plasmas were investigated. A nonlinear theory of unstable collisional drift wave, and the consequent nonlinear transport were extended to include electron and ion temperature gradients. Thermal transport properties are discussed and basic equations are given.

45951 (N—77-33997) **Theory of two-fluid equilibrium of an axially symmetric plasma.** Watanabe, T.; Nishikawa, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1977. 25p. (IPPJ—282). NTIS PC A02/MF A01.

The two-fluid equilibrium of an axially symmetric plasma may be determined by a formula which is particularly useful for the case when a local charge separation causes a deviation of the equipotential surface from the magnetic surface. The inertia force due to plasma motion is considered in the form of a modified electrostatic potential (caused by centrifugal force) and a modified magnetic field (caused by Coriolis force). A set of partial differential equations which determine the modified flux functions and the self-consistent electric and magnetic fields are derived. The poloidal drift flux on the modified magnetic surface and the density and temperature in the absence of both the electrostatic potential and the plasma flow are assumed. The result is formulated as a variation principle which contains no constraints and hence is useful for numerical and perturbational analysis.

45952 (PPGM—R95-76) **Preliminary study on plasma physics and its applications.** Budi Santoso. (Gama Research Centre, Jogyakarta (Indonesia)). 1976. 36p. (In Indonesian). Dep. NTIS (US Sales Only), PC A03/MF A01.

Plasma and its application are considered from the basic point of view. Plasma physics is introduced through the corresponding fundamental observable parameters. These parameters will be studied further in the plasma diagnostics.

45953 **Neoclassical current in a toroidally-confined multispecies plasma.** Hirshman, S.P. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08540). *Phys. Fluids;* **21**: No. 8, 1295-1301(Aug 1978).

The parallel currents in a toroidally-confined plasma is shown to consist of the current in response to the parallel electric field, the Pfirsch—Schlueter current which is required by charge neutrality, and the bootstrap current which flows to maintain a balance between the viscous and friction forces along the magnetic field. The steady state momentum equation is used to obtain an Ohm's law relating the neoclassical current to the cross-field fluxes of particles and heat in a multiple ion species plasma. It is found that the presence of impurities does not alter the magnitude of the bootstrap current. Thus, the neoclassical beta limit established by the bootstrap current is insensitive to the impurity content of the plasma. The magnitudes of the bootstrap current and conjugate Ware fluxes are calculated in the transition from the long mean-free-path to collisional regime.

45954 **Effects of high-frequency fields on plasma transport coefficients.** Bernstein, I.B.; Max, C.E.; Thomson, J.J. (Yale University, New Haven, Connecticut 06520). *Phys. Fluids;* **21**: No. 6, 905-914(Jun 1978).

It is shown that laser fields in plasmas, in addition to the usual ponderomotive force in the center-of-mass momentum equation, give rise to significant modifications of the material stresses and additional terms in the Ohm's law and equation for the heat flow vector. These are evaluated explicitly for the case of a single geometric optics field assuming that the slowly varying part of the electron distribution function is collision dominated, that the equation for the high frequency part can be linearized, and that the effective charge number $Z >> 1$. The new terms are all roughly proportional to the energy density in the high-frequency field. They are thus comparable in magnitude with conventional ponderomotive forces.

45955 **Transport of a nonneutral electron plasma due to electron collisions with neutral atoms.** Douglas, M.H.; O'Neil, T.M. (Department of Physics, University of California, San Diego, La Jolla, California 92093). *Phys. Fluids;* **21**: No. 6, 920-925(Jun 1978).

Transport of a nonneutral electron plasma across a magnetic field is caused by electron scattering from ambient neutral atoms. A theoretical model of such transport is presented, assuming the plasma is quiescent and the scattering is elastic scattering from infinite mass scattering centers of constant momentum transfer cross section. This model is motivated by recent experiments. A reduced transport equation is obtained by expanding the Boltzmann equation for the electron distribution in inverse powers of the magnetic field. The equation together with Poisson's equation for the radial electric field, which must exist in a nonneutral column, determine the evolution of the system. When these two equations are properly scaled, they contain only a single parameter: the ratio of initial Debye length to initial column radius. For cases where this parameter is either large or small, analytical solutions, or at least partial solutions, are obtained. For intermediate values of the parameter, numerical solutions are obtained.

45956 **Runaway electrons in collective electric fields.** Hui, B.H.; Winsor, N. (Science Applications, Inc., McLean, Virginia 22101). *Phys. Fluids;* **21**: No. 6, 940-944(Jun 1978).

The interactions of runaway electrons with the anomalous-Doppler-shifted mode and a bump-on-tail mode are studied numerically using the Fokker—Planck equation with a self-consistent quasilinear diffusion operator. It is shown that a velocity threshold exists, below which electrons are not pitch-angle scattered by the self-consistent electric fields. The observed long-time behavior of synchrotron radiation data implies that this velocity threshold must shift to higher velocity as an experiment progresses.

45957 **Lie-operator approach to mode coupling in nonuniform plasma.** Johnston, S.; Kaufman, A.N. (Plasma Physics Laboratory, Columbia University, New York, New York 10027). *Phys. Rev. Lett.;* **40**: No. 19, 1266-1269(8 May 1978).

Hamiltonian perturbation theory based on recent Lie transform techniques is applied to the Hamiltonian of a single particle in nonuniform Vlasov plasma. A simple relation is derived between the field-plasma interaction energy and the transformed single-particle Hamiltonian. This relation implies as special cases a general formula for ponderomotive force in terms of the linear Vlasov susceptibility, and a symmetric Poisson-bracket formula for the general three-mode coupling coefficient.

45958 **Modelling of MHD equilibria of the Garching Belt Pinches by a cylindrical slab.** Becker, G. (Association Euratom-Max-Planck-Institut fuer Plasmaphysik, Garching/Muenchen (Germany, F.R.)). *Nucl. Fusion;* **18**: No. 1, 9-13(1978).

For a toroidal sheet pinch, analytic relations are derived for βsub(p), the position of the magnetic axis, the poloidal magnetic field and the critical βsub(p) values. Comparisons with numerical solutions show that the Garching Belt Pinch equilibria can very well be approximated by an infinite cylindrical slab model. The βsub(p) limits for the occurrence of current reversal and a biaxial configuration may provide a better understanding of the whole class of strongly elongated equilibria with "flat current distributions".

45959 O-H charge exchange in cold, dense hydrogen plasmas. Cohen, S.A.; Dylla, H.F. (Princeton Univ., N.J. (USA). Plasma Physics Lab.). *Nucl. Fusion;* **18**: No. 1, 5-8(1978).

It is pointed out that the accidentally resonant charge-exchange reaction, $O^+ + H^0$ reversible $O^0 + H^+$, is an important mechanism for causing the loss of singly charged oxygen ions from oxygen-contaminated hydrogen plasmas. Results of a Monte Carlo simulation are presented which show that the fraction of oxygen lost because of charge exchange exceeds 1/3 when the parameters nsub(e) approximately $10^{13}cm^{-3}$, nsub(H^0) approximately $10^{11}cm^{-3}$ and Tsub(e) approximately 3eV are attained. This process may be important in determining impurity losses from the edge plasmas of tokamaks.

45960 Multigroup calculations of low-energy neutral transport in tokamak plasmas. Gilligan, J.G.; Gralnick, S.L.; Price, W.G. Jr. (Princeton Univ., N.J. (USA). Plasma Physics Lab.); Kammash, T. (Michigan Univ., Ann Arbor (USA). Dept. of Nuclear Engineering). *Nucl. Fusion;* **18**: No. 1, 63-85(1978).

Multigroup discrete ordinates methods avoid many of the approximations that have been used in previous neutral transport analyses. Of particular interest are the neutral profiles generated as an integral part of larger plasma system simulation codes. To determine the appropriateness of utilizing a particular multigroup code, ANISN, for this purpose, results are compared with the neutral transport module of the Duechs code. For a typical TFTR plasma, predicted neutral densities differ by a maximum factor of three on axis and outfluxes at the plasma boundary by approximately 40%. This is found to be significant for a neutral transport module. Possible sources of the observed discrepancies are indicated from an analysis of the approximations used in the Duechs model. Recommendations are made concerning the future application of the multigroup method.

45961 Expression for β in linked min-B configurations. Ikuta, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). *Nucl. Fusion;* **18**: No. 2, 294-295(1978).

Letter-to-the-editor.

A formula for the β-ratio of confined low-pressure plamsa in linked magnetic wells within the magnetic surface is derived.

45962 Plasma transport across a braided magnetic field. Stix, T.H. (Princeton Univ., N.J. (USA). Plasma Physics Lab.). *Nucl. Fusion;* **18**: No. 3, 353-358(1978).

Simple fluid and particle models are used to estimate the transport of density, current, and electron heat for a plasma immersed in a region through which magnetic lines of force meander in a stochastic fashion and in which magnetic surfaces are destroyed.

45963 Self-similar snowplow plasma flows. Inogamov, N.A.; Anisimov, S.I. (L. D. Landau Institute of Theoretical Physics, Academy of Sciences of the USSR). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 457-459(Nov 1977).

Exact particular solutions are obtained of the hydrodynamic equations describing the magnetic compression of an initially homogeneous plasma and the laser compression of solid and shell targets.

45964 Residual ionization in the expansion of a laser-produced plasma. Busygin, A.I. (Moscow Physicotechnical Institute). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 468-469(Nov 1977).

A condition is found for determining the stage of plasma expansion in vacuum at which ionization quenching occurs.

45965 Steady-state radiative cooling rates for low-density, high-temperature plasmas. Post, D.E.; Jensen, R.V.; Tarter, C.B.; Grasberger, W.H.; Lokke, W.A. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08540). *At. Data Nucl. Data Tables;* **20**: No. 5, 397-439(Nov 1977).

For 47 elements in the range $2 <$ or $= Z <$ or $= 92$, steady-state radiative cooling rates, average charge states $<Z>$, and mean-square charge states $<Z^2>$ have been calculated for low-density, high-temperature plasmas (n/sub e/ < or $\approx 10^16$ electrons/cm^3 and T=0.002-100 keV). The average-ion model described in the Appendix was used. The 47 materials treated include many materials of interest in controlled fusion research. The results are presented in graphs and tables. The graphs show curves calculated from the model and least-squares polynomial fits to these curves. The tables present coefficients for the least-sqaures fits.

45966 Pfirsch—Schlueter impurity diffusion. Zhdanov, V.M.; Yushmanov, P.N. (Energiya). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 662-667(Nov 1977).

The transport of impurities of arbitrary mass and charge in toroidal systems is studied. The diffusion and heat fluxes of impurity ions under Pfirsch—Schlueter conditions are derived from the hydrodynamic transport equations with the kinetic coefficients calculated for an arbitrary ion mass ratio. The condition for thermal shielding of the impurity is found. This shielding can occur in regions where the plasma temperature falls off rapidly in the radial direction in the case $Z_1 <$ or $= 4$ (Z_1 is the ion charge). The effect of heat exchange between the plasma components on the ion diffusion is analyzed. A reduction of the heat exchange between ions and between ions and electrons weakens the shielding effect.

45967 Kinetics of neutral atoms near the wall of a fusion reactor and impurity formation. Volkov, T.F.; Igitkhanov, Y.L. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 668-672(Nov 1977).

The distribution function, density, and fluxes of neutral atoms near the first wall in a fusion reactor are found from the kinetic equation and the boundary conditions. The role played by untrapped neutrals is discussed. The results are used to estimate the number of impurities which can enter the working volume due to sputtering of the wall by neutral atoms.

45968 Injection of a relativistic electron beam into a bounded plasma in a magnetic field. Rosinskii, S.E.; Rostomyan, E.V.; Rukhlin, V.G. (Moscow Institute of Radio Engineering, Electronics, and Automation). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 692-696(Nov 1977).

The magnetic field and charge induced by the injection of an electron beam into a radially bounded magnetized plasma (a plasma-filled waveguide) are studied. In a magnetized plasma, the radial field may change from one localized in a skin region to a spatially oscillatory configuration. In a dense plasma, the oscillation amplitude of the azimuthal magnetic field is small in comparison with the magnetic field of the beam itself, so that the beam is current-neutralized. On the other hand, there is no charge neutralization. The resonant values of the parameters of the system are found. At these values, even if there is a strong magnetic field, there is a complete current and charge neutralization of the beam over its entire cross section, or the induced fields are many times stronger than the fields of the beam itself.

45969 Charge and current neutralization in the injection of an electron beam into a bounded waveguide containing a magnetized plasma. Grishin, V.K.; Rosinskii, S.E.; Rukhadze, A.A.; Rukhlin, V.G. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 696-700(Nov 1977).

A study is made of space charge and current neutralization injection of a relativistic electron beam into a plasma-filled waveguide which is bounded in the longitudinal direction. The beam density is assumed small in comparison with the plasma density, so that the beam current can be assumed to be given. A strong longitudinal magnetic field is imposed on the system to prevent transverse spreading of the beam. The nature of the neutralization is strongly affected by the reflection from the ends of the system and the interference of the oscillatory fields induced by the beam. These changes are not taken into account in models with an infintely long drift tube.

45970 Effect of neutral injection on impurity diffusion in a collisional tokamak. Fomenko, V.V. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 775-777(Nov 1977).

Changes in the diffusion fluxes in a plasma due to continuous neutral particle injection are calculated for the PFirsch-Schlueter case.

45971 Effect of neutral injection on particle diffusion and heat transfer under neoclassical conditions. Fomenko, V.V. (I. V. Kuchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 777-778(Nov 1977).

It is shown that the changes in the heat and particle fluxes due to neutral-particle injection are comparable to those due to density and temperature gradients.

45972 Optimum parameters of a dense freely expanding deuterium—tritium plasma. Kolesnikov, E.K.; Rozov, A.L. (A. A. Zhdanov State University, Leningrad). *Sov. Phys. - Tech. Phys. (Engl. Transl.);* **22**: No. 10, 1292-1293(Oct 1977).

The fusion energy yield is calculated analytically for an expanding D.T plasma. (AIP)

45973 Simple model for the evolution of the plasma focus. Vikhrev, V.V. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 539-542(Sep 1977).

A phenomenological approach is proposed for describing the evolution of the plasma focus. A simple model leads to a good description of the focus dynamics and of the neutron emission from the focus. According to this model, fusion temperatures, 10—20 keV, are in fact achieved in a plasma focus, and the value of the product n tau at these temperatures is $2x10^{11}$ sec/cm^3. The consequences of this model are discussed, and ways to further raise the emission of fusion neutrons are discussed.

45974 Dynamics of a multicomponent plasma in a quasisteady coaxial accelerator with an azimuthal magnetic field. Shubin, A.P. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 542-547(Sep 1977).

The dynamics of a multicomponent dissipationless plasma in the strong azimuthal magnetic field produced by the plasma itself is analyzed. The plasma ions differ in charge and mass. Calculations are carried out for particular types of plasma flow. It is shown that a separation of the various components may occur.

45975 Cathode potential drop in the channel of a magnetoplasma compressor. Shubin, A.P. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 547-549(Sep 1977).

Calculations are carried out for the dissipationless plasma flow in the channel of a magnetoplasma compressor when there is a potential drop near the cathode. This drop appears when the current is carried by ions as the result of the disappearance of ions at the cathode.

45976 Turbulent diffusion in a multicomponent plasma. Belikov, V.S.; Kolesnichenko, Y.I. (Institute of Nuclear Research, Academy of Sciences of the Ukrainian SSR, Kiev). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 592-596(Sep 1977).

The adiabatic interaction of waves with particles in steady-state turbulence does not result in diffusion of these particles across the magnetic field, according to an analysis based on the quasilinear equations for the particle distribution function. The relative directions of the turbulent particle fluxes are determined through a qualitative analysis of turbulent diffusion in a multicomponent plasma. A general expression is also found for the particle fluxes. This expression takes into account the induced scattering of waves by particles. A method is worked out for finding the quantities which appear in this expression for the case in which there are particle sources in the plasma. Turbulent diffusion in a thermonuclear plasma is treated as an example.

45977 Quasilinear relaxation of a beam interacting with an isotropic plasma. Bespalov, P.A. (Scientific-Research Radiophysical Institute, Gor'kii). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 619-624(Sep 1977).

The three-dimensional quasilinear relaxation of a beam—isotropic plasma system is studied. The relaxation causes a shift of the wave spectrum toward small longitudinal phase velocities, and the particle distribution in velocity space becomes isotropic.

45978 Charge exchange in plasmas. Zhdanov, V.P.; Kvlividze, V.A.; Chibisov, M.I. (Nuclear Physics Research Institute of the Moscow State University). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 6, 1073-1075(Jun 1977).

Charge exchange induced by collisions with electrons is considered. It is shown that in a plasma under certain conditions, three-body collisions resulting in charge exchange become significant at electron densities n/sub e/ of $\sim 10^{12}$ cm^{-3}. As an example, it is shown that for an Rb-Cs plasma with atomic velocities v/sub n/ of $\sim 10^6$ cm/sec, electron velocities v/sub e/ of $\sim 7x10^7$ cm/sec, and a resonance defect n_0 of ~ 0.28 eV, the electron-induced charge exchange cross section is $3x10^{-32}$n/sub e/ cm^2, this is a thousand times greater than the charge exchange cross section calculated with allowance for Coulomb detuning (R. Z. Vitlina and A. V. Chaplik, Zh. Eksp. Teor. Fiz. 70, 543 (1976)/Sov. Phys.-JETP 43, 280 (1976)/). It is also shown that in a cesium plasma the decrease in the resonance charge exchange cross section due to Coulomb detuning is compensated by charge exchange induced by electron collisions.

45979 Irreversibility of electrostatic plasma turbulence. Ahmadi, G. (Pahlavi Univ., Shiraz (Iran)). *Indian J. Phys., Parts A, B;* **51**: No. 1, 33-35(Jan 1977).

A possible definition of entropy similar to the classical kinetic theory of gases is considered and Boltzmann H theorem is extended to the electrostatic weak plasma turbulence. It is shown that in a weakly turbulent plasma entropy must increase and therefore it is irreversible in contrast to the stable Vlasov plasma.

PLASMA PRODUCTION

45980 Nonuniform mesh diode simulation code. Quintenz, J.P. (Plasma Theory Division-5241, Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 8, 4377-4382(Aug 1978).

A new version of a diode simulation code has been written which allows for nonuniform zoning in both the r and z directions. This new flexibility enables more accurate treatment of crucial areas in the diode such as near emission surfaces and in target regions. The new code also has the ability to treat slanted surfaces such as that found in a tapered cathode diode. An interesting result of the new code is that a "parapotential" cathode pinches better than the corresponding flat cathode at the same total current.

45981 Studies of laser-driven shock waves in aluminum. Veeser, L.R.; Solem, J.C. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Rev. Lett.;* **40**: No. 21, 1391-1394(22 May 1978).

We have observed the structure and velocity of laser-driven shock waves in aluminum foils. We have measured shock velocities as high as 13 km/s and shock luminosity rise-times less than 50 ps, and we have inferred pressures of 200 GPa and shock-front thicknesses < 0.7 μm. These results suggest that such techniques may be used for measuring equation-of-state parameters and studying the detailed structure of shock fronts.

45982 Electron density and electron temperature in a neon plasma generated by 20-MeV protons. Coolen, F.C.M.; van Schaik, N. (Technische Hogeschool Eindhoven (Netherlands)). *Physica, B, C;* **93**: No. 1, 121-130(1978).

The electron density and the electron temperature in a plasma, produced by irradiation of a neon gas with a beam of 20-MeV protons, has been studied. Various neon densities in the range from 1.5×10^{23} m^{-3} to 6.3×10^{24} m^{-3} and proton beam currents from 3 nA to 6 μA have been taken. By repeatedly pulsing the proton beam, such conditions were set up that the electron density was determined from the time dependence of the intensity of recombination-induced line radiation during the afterglow. From the relevant measurements it followed that the total cross-section for primary and secondary ionization of neon by 20-MeV protons is $(1.7+-0.3) \times 10^{-21}$ m^2. By comparing the observed time dependence of recombination-induced line radiation with the results obtained from a numerical model it could be concluded that the electron temperature in a plasma produced by a continuous proton beam of 6 μA in neon of density 6.3×10^{24} m^{-3}, be three times as high as the gas temperature (room temperature). This could be ascribed to the energy transfer of fast secondary electrons to the bulk electrons in the plasma. Finally, the relative production in the plasma of 1s states and the relative population of 2p states obtained by the dissociative recombination process is measured for neon of density 3.7×10^{24} m^{-3} at room temperature.

45983 Beam—plasma discharge in crossed electric and magnetic fields. Babaritskii, A.I.; Ivanov, A.A.; Severnyi, V.V.; Shapkin, V.V. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 11, 643-644(Nov 1977).

A facility is described in which electron beams are used to produce a fully ionized steady rotating plasma.

45984 Formation of plane shock wave in the plasma focus zone of a magnetoplasma compressor. Kozlov, N.P.; Protasov, Y.S. (N. E. Bauman Moscow College of Engineering). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 11, 673-675(Nov 1977).

A method is proposed for the production of a highly nonideal plasma in a vacuum of 10^- 6 torr.

45985 Electric field of a laser spark ignited near a conducting target. Goncharov, N.I.; Konov, V.I.; Murina, T.M.; Nikitin, P.I.; Prokhoerov, A.M.; Sidorinn, V.M.; Chudnenko, V.A. (P. N. Lebedev Physics Institute, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 407-410(5 Oct 1977).

A double electric-field burst was observed in the breakdown of air by laser radiation near a conducting target. The appearance of the electric field is attributed to the separation of the charges on the front of the optical detonation wave and to a shock wave propagating from the plasma.

45986 Coaxial accelerator for dense plasmas. Komel'kov, V.S.; Modzolevskii, V.I. (G. M. Krzhizhanovskii State Scientific-Research Energetics Institute). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 533-538(Sep 1977).

This coaxial plasma accelerator has an outer electrode whose diameter (12 mm) is much smaller than that in Marshall guns, and the hydrogen pressure at the beginning of the discharge (30—760 torr) is much higher. It is found that the current in the nozzle flows in a filament 3—8 mm in diameter. This filament represents a plasma continuation of the inner electrode. On the basis of the close correspondence between the curves of the motion of the emitting fronts and the motion of the center of gravity of the current it is concluded that the current is concentrated at the front of the plasma, so that the "snowplow" model can be used. Calculations show that this model becomes more appropriate for the process under study as the initial hydrogen pressure in the chamber is raised. The discrepancy be-

tween the calculated and measured values increases with decreasing pressure because of the "sag" of the current near the insulator and the ablation of this insulator, which lead to an increase in the accelerated mass and to a shunting of the current sheath. Nevertheless, for initial hydrogen pressures in the range 30—760 torr, even if the "plowing" is neglected, the density in the frontal plasma sheath reaches $9x10^{1}8$—$6x10^{2}0$ $cm^{-}3$, for velocities of $7.8x10^{6}$—$3.1x10^{6}$ cm/sec, respectively, at the end of the nozzle. The velocity can be raised by raising the working current and the voltage on the capacitor. The size and shape of the electrodes should also be varied. A film seal is used to achieve plasma acceleration into vacuum. At a film thickness of 50 μ and a hydrogen pressure of 760 torr under the film the velocity of the plasma front at a point 20 cm beyond the end of the nozzle is relatively constant at $3.3x10^{6}$ cm/sec. A reduction of the hydrogen pressure under the film does not result in a velocity increase.

45987 Absorption of laser radiation in the deionization stage of a laser spark. Gudilin, I.A.; Evseenko, V.P.; Mitsuk, V.E.; Chernikov, V.A. (Physics Department, M. V. Lomonosov Moscow State University). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 577-580(Sep 1977).

The mechanism for the absorption of laser radiation in a laser spark is studied. Spatial and temporal characteristics of the optical thickness and absorption coefficient of the plasma are found experimentally in the deionization stage. When the intensity of the radiation producing the spark is substantially above the threshold (by a factor of ten), the absorption coefficient is very inhomogeneous along the axis of the spark channel, because of the essentially simultaneous breakdown at several points in the focal region. The velocities of the absorbing front in both directions from the focus are measured. The results are compared with theoretical estimates obtained on the basis of a detonation mechanism for the absorption.

45988 Laser-produced plasma of two-component mixtures. Bykovskii, Y.A.; Sil'nov, S.M.; Sharkov, B.Y.; Sheroziya, G.A.; Shubalov, S.M. (Moscow Engineering Physics Institute). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 639-641(Sep 1977).

The ionization and expansion of a laser-produced plasma is studied for the case of a target composed of a mixture of two elements.

PLASMA INSTABILITIES

45989 (N—77-33991) **Theory for space-time evolution of explosive-type instability.** Watanabe, M.; Nishikawa, K.; Wilhelmsson, H. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jan 1977. 11p. (IPPJ—276). NTIS PC A02/MF A01.

A solution is presented describing space-time evolution of a resonantly interacting system of a damped negative energy wave and two undamped wave packets of positive energies. It is shown that all three waves grow simultaneously when they are approaching each other, while a certain threshold condition is required for instability when they are separating.

45990 (N—77-33993) **Saturation of kink instability and helical equilibrium of current carrying plasma column.** Itoh, K.; Inoue, S.; Yoshikawa, S. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Feb 1977. 12p. (IPPJ—278). NTIS PC A02/MF A01.

By means of the neighbouring equilibrium method the saturation level of the kink instability of a current carrying plasma column is investigated. We obtain the helical equilibrium which is the stationary saturated stage of kink instability. The analysis is performed for the rounded current profile case and shows that the shell has very strong suppression effect on the saturation level.

45991 (N—77-34002) **Microinstabilities in a plasma slab with steep density gradient.** Sanuki, H.; Watanabe, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jun 1977. 22p. (IPPJ—294). NTIS PC A02/MF A01.

An integral dispersion relation in k-space was derived for the linear normal modes of electrostatic perturbations in an inhomogeneous plasma under the presence of a strong ambipolar electric field. This ambipolar field causes electron drift with the velocity shear. Under a local method the effects of ambipolar field and magnetic curvature on drift wave were investigated in a cusped configuration system. The cusped magnetic curvature tends to have a stabilizing effect in addition to the ambipolar field on a drift instability.

45992 Resistive hose instability of a beam with the Bennett profile. Lee, E.P. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Fluids;* **21**: No. 8, 1327-1343(Aug 1978).

The resistive hose instability of a self-pinched relativistic beam is examined with emphasis placed on the important case of the Bennett current profile J/sub B/(r) proportional $(1+r^{2}/a^{2})^{-2}$. Previously known results applicable to a general profile are recovered and extended in several directions. An essential new feature in this study is the use of distributed particle mass to model orbital phase-mixing effects produced by the anharmonic pinch field. Resonant growth is considerably reduced, and the instability when viewed in the beam reference frame is shown to be convective rather than absolute. The peak amplitude of a disturbance wave packet moves from the point of its inception in the beam pulse toward the pulse tail. The disturbance subsequently damps if the pulse length is finite; thus, propagation over distances that are long compared with the particle betatron wavelength is possible. The predicted growth rate and group velocity of the mode are shown to be in fair agreement with the results of numerical simulation.

45993 Measurements of hose instability of a relativistic electron beam. Lauer, E.J.; Briggs, R.J.; Fessenden, T.J.; Hester, R.E.; Lee, E.P. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). *Phys. Fluids;* **21**: No. 8, 1344-1352(Aug 1978).

The observed disruption of a self-focused, relativistic electron beam propagating through a gas is shown to result from the growth of m=1 ("kink" or "hose") perturbations. Measurements of the frequency dependence of the spatial amplification rate are presented. An upper cutoff to the frequency range for hose amplification is observed, in agreement with a theoretical model that includes the damping effects of a spread in the particle betatron frequency.

45994 Toroidal mode coupling effects on drift wave stability. Horton, W. Jr.; Estes, R.; Kwak, H.; Choi, D. (Fusion Research Center and Department of Physics, The University of Texas at Austin, Austin, Texas 78712). *Phys. Fluids;* **21**: No. 8, 1366-1374(Aug 1978).

Modified drift wave dispersion relations and shear stabilization criteria are derived from an analysis of the radial drift wave equations coupled in azimuthal mode numbers through the toroidal effects of ion magnetic drifts and trapped electrons.

45995 Quasi-linear stabilization of lower-hybrid-drift instability. Davidson, R.C. (Department of Energy, Washington, D. C. 20545). *Phys. Fluids;* **21**: No. 8, 1375-1380(Aug 1978).

The quasi-linear evolution of the lower-hybrid-drift instability is investigated for cross-field current velocities less than the ion thermal velocity (V/sub d/<v/sub i/). It is shown that current relaxation (V/sub d/→0) and plateau formation (partialF/sub i//partialv/sub y/→0) in the ion velocity distribution are generally competing processes for stabilization. A detailed analysis of the energetics of the system is utilized to estimate the saturation level E/sub s/=∫dk/sub y/E/sub k/y-italic (t→∞) of the turbulent field fuctuations.

45996 Nonlinear development of the negative-mass instability and its effect on intense microwave generation. Goren, Y.; Uhm, H.; Davidson, R.C. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *J. Appl. Phys.;* **49**: No. 7, 3789-3791(Jul 1978).

The nonlinear development of the negative-mass instability is investigated for a thin E layer (Δvery-much-less-thanR_0) located inside a cylindrical waveguide. A quasilinear analysis shows that the instability saturates by the development of an energy spread and a corresponding increase in thickness Δ of the E layer. The efficiency of microwave generation by this instability is also calculated.

45997 Variational theory of drift and tearing eigenmodes in slab geometry. Hazeltine, R.D.; Ross, D.W. (Fusion Research Center, The University of Texas at Austin, Austin, Texas 78712). *Phys. Fluids;* **21**: No. 7, 1140-1150(Jul 1978).

A variational formulation of the radial eigenmode equations describing kink-tearing modes, drift-tearing modes, and drift modes, in slab geometry, is derived. The formalism is shown to provide accurate dispersion relations for a wide range of problems, with fewer approxmimations and less analytical effort than conventional methods require. Furthermore, derivation from a unified framework illuminates the relationships between different instabilities. The variational method is particularly well suited to the approximate solution of physically realistic problems, heretofore considered tractable only by numerical methods.

45998 Turbulence theory for the dissipative trapped electron instability. Tsang, K.T.; Callen, J.D.; Vahala, G. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Fluids;* **21**: No. 7, 1172-1180(Jul 1978).

Drift orbit diffusion induced by turbulence acting on trapped electrons is shown to reduce and broaden the magnetic drift resonance and produce the dominant nonlinear saturation mechanism for the dissipative trapped electron instability. The fluctuation level obtained from such a theory is found to be consistent with present experimental observations.

45999 Density gradient drift instabilities: Oblique propagation at zero beta. Gary, S.P.; Sanderson, J.J. (Los Alamos Scientific Labora-

tory, University of California, Los Alamos, New Mexico 87545). *Phys. Fluids;* **21**: No. 7, 1181-1187(Jul 1978).

The linear Vlasov dispersion relation for electrostatic instabilities driven by a cross field current due to a density gradient in a unidirectional magnetic field is examined in the local approximation. Both electrons and ions are taken as magnetized, and propagation is in the plane defined by the drift velocity and the magnetic field. Three instabilities are studied and compared: the lower hybrid drift, ion cyclotron drift, and the universal drift instability. Thresholds and properties at oblique propagation are studied for a wide range of drift speeds and T/sub e//T/sub i/ ratios. Each of these modes propagates at sufficiently oblique angles to prevent stabilization due to finite length in typical linear theta pinches greater than several hundred ion gyroradii in length.

46000 Rotational instabilities in a theta pinch. Freidberg, J.P.; Pearlstein, L.D. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Fluids;* **21**: No. 7, 1207-1217(Jul 1978).

The stability of a rotating θ pinch is investigated in the context of the finite Larmor radius fluid equations. The main result is the discovery of an unstable m=1, n=0 mode (m is the azimuthal mode number and n is the number of radial modes) whose threshold is the lowest of any unstable mode. A comparison with experiment indicates that this mode may be the one responsible for the m=1 "wobble" instability observed in high temperature θ pinches.

46001 Finite Larmor radius equations in an arbitrary near-theta pinch geometry. Pearlstein, L.D.; Freidberg, J.P. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Fluids;* **21**: No. 7, 1218-1226(Jul 1978).

A set of fluid-like equations is derived which describes the stability of a diffuse, high β, arbitrary, near-θ pinch configuration. The equations simultaneously include geometric effects which drive ideal magnetohydrodynamic instabilities and kinetic effects which give rise to finite Larmor radius stabilization. A simple heuristic procedure is given for determining these equations in addition to a full derivation starting from basic principles.

46002 Heat flux reduction by electromagnetic instabilities. Ramani, A.; Laval, G. (Department of Physics, Princeton University, Princeton, New Jersey 08540). *Phys. Fluids;* **21**: No. 6, 980-991(Jun 1978).

Heat flux inhibition by microinstabilities in hot and dense plasmas is investigated. Because of the anisotropy induced by the temperature gradient, Weibel-like low frequency electromagnetic modes become unstable. The chaotic magnetic field thus generated effectively reduces the electron mean-free-path. Saturation of these instabilities is expected from mode-mode couplings. With the estimated saturation level, the mean-free-path is self-consistently found to be smaller than the typical gradient length L, thus keeping the heat flux below the free streaming value, with a reduction factor $\epsilon' = (c/L\omega/\text{sub p/})/\text{sup } 1/3/$.

46003 Influence of magnetic shear on the lower-hybrid-drift instability in toroidal reversed-field pinches. Davidson, R.C.; Gladd, N.T.; Goren, Y. (Division of Magnetic Fusion Energy, Energy Research and Development Administration, Washington, D. C. 20545). *Phys. Fluids;* **21**: No. 6, 992-999(Jun 1978).

The influence of magnetic shear on the lower-hybrid-drift instability is investigated, including application to microstability properties of post-implosion reversed-field-pinch profiles. Two complementary analyses are performed. One analysis includes the influence of magnetic shear and finite ion beta in a fully electromagnetic model that assumes T/sub e//T/sub i/very-much-less-than1, but otherwise incorporates the effects of transverse magnetic perturbations ($\delta B_{not} = 0$). The other analysis includes the influence of magnetic shear and finite T/sub e//T/sub i/ in an electrostatic model that neglects finite plasma beta effects. In both cases, it is found that sufficiently strong magnetic shear can completely stabilize the lower-hybrid-drift instability. The theoretical model is used to investigate the microstability properties of post-implosion reversed-field-pinch profiles. It is shown that the lower-hybrid-drift instability persists in regions of moderate magnetic shear only if the local density gradient is sufficiently large. Moreover, for the diffuse profiles anticipated in the Los Alamos ZT-40 experiment, the lower-hybrid-drift instability is completely stabilized.

46004 Slope reversal of a monotonically decreasing electron tail in a strong magnetic field. Haber, I.; Huba, J.D.; Palmadesso, P.; Papadopoulos, K. (Naval Research Laboratory, Washington, D. C. 20375). *Phys. Fluids;* **21**: No. 6, 1013-1016(Jun 1978).

An electron distribution with a long tail can be driven unstable by the resonant transfer of tail particle energy to electron cyclotron waves. The implications of this instability are examined by following its nonlinear evolution. The growth of wave energy can result in the formation of a positively sloped region of the electron distribution function. This positive slope causes a second mode to go unstable which subsequently results in large pitch angle diffusion of the tail particles.

46005 Particle simulation studies of the lower hybrid drift instability. Winske, D.; Liewer, P.C. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Fluids;* **21**: No. 6, 1017-1025(Jun 1978).

The nonlinear phase of the lower hybrid drift instability in the high drift velocity regime (relative electron-ion drift velocity greater than ion thermal speed) has been investigated using particle simulation in a two-dimensional sheath geometry. The anomalous resistivity is measured at various times and is shown to be in good agreement with quasi-linear theory during both the linear and nonlinear phase of the instability. Saturation is due to ion trapping.

46006 Nonlinear evolution of drift Alfven and double tearing instabilities. Lin, A.T. (Center for Plasma Physics and Fusion Engineering, University of California, Los Angeles, California 90024). *Phys. Fluids;* **21**: No. 6, 1026-1031(Jun 1978).

A particle model which neglects the compressional components of the axial magnetic field perturbation has been developed to investigate the time evolution of drift Alfven and double tearing instabilities in a finite but low β (plasma pressure/magnetic pressure) plasma. It is observed that in a currentless plasma the shear Alfven wave and the drift wave couple together and become unstable. The smoothing out of the density profile limits the growth of the instability. In a plasma with current flowing along the magnetic field line the instability becomes a drift-tearing type which is driven by the magnetic field energy associated with the plasma current. The growth and the interaction of sets of magnetic islands on adjacent rational surfaces results in generation of smaller islands and reconnection of magnetic lines of force between different rational surfaces. This effect enhances local heat and particle transport.

46007 Computation of two-stream explosive instability including harmonics generation and distribution function evolution. Sedlacek, Z. (Ceskoslovenska Akademie Ved, Prague. Ustav Fyziky Plazmatu). *Phys. Lett., A;* **64**: No. 4, 393-394(9 Jan 1978).

Self-consistent computation of the two-stream explosive instability revealed an abrupt and almost complete deceleration of the streams accompanied by saturation of the explosive growth and formation of a turbulent state.

46008 Electromagnetic ion beam instability and energy loss of fast alpha particles. Gary, S.P. (Los Alamos Scientific Lab., N.Mex. (USA)). *Nucl. Fusion;* **18**: No. 3, 327-334(1978).

A high-speed ion beam directed along a uniform magnetic field can excite an electromagnetic ion beam instability. The linear and second-order theory of this instability is considered. If the beam is sufficiently dense, and if the saturation level is sufficiently high, the anomalous energy loss distance is much shorter than the classical mean free path. A possible application to alpha-particle energy loss in a linear multiple mirror theta pinch is discussed.

46009 Stability of neoclassical EBT operating points. McBride, J.B.; Sulton, A.L. Jr. (Science Applications, Inc., La Jolla, Calif. (USA)). *Nucl. Fusion;* **18**: No. 2, 285-289(1978).

Letter-to-the-editor.

A stability analysis of the neoclassical point model of EBT distinguishes the sign of the self-consistent radial ambipolar field for a given type of plasma profile. Positive electric fields correspond to normal plasma profiles (peaked at the centre) and negative electric fields correspond to inverted profiles (depressed at the centre). These results provide a further macroscopic prediction against which neoclassical theory is to be tested experimentally.

46010 Kinetic theory of runaway electron beam instability in a tokamak. Parail, V.V.; Pogutse, O.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). *Nucl. Fusion;* **18**: No. 3, 303-314(1978).

The paper considers the effects associated with the development of accelerated electron beam instability in a tokamak. The authors have investigated the microscopic stage of instability development in greater detail than in their earlier work. The instability threshold has been found by taking the actual distribution function into account. It is shown that the development of instability comprises two stages - isotropization of electrons due to the anomalous Doppler effect and subsequent formation of a plateau on the electron distribution function. It is at the second stage that oscillations of noticeable energy occur. It is demonstrated that the result of quasi-linear relaxation depends substantially on whether or not the oscillations pass out of the resonance region during instability development. The detailed picture which emerged made it possible to evaluate the basic macroscopic effects - the number of trapped electrons and their energy, the magnitude of ion heating and the sign and magnitude of spikes on the voltage curve. The evaluations obtained give a correct qualitative and, in some cases, quantitative description of the dependences measured experimentally.

46011 Parametric processes in magnetically confined CTR plasmas. Porkolab, M. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Physics). *Nucl. Fusion;* **18**: No. 3, 367-413(1978).

The theory and present experimental status of parametric instabilities in CTR oriented magnetized plasmas is reviewed. Both linearized theory and the most recent non-linear theory are summarized in a compact form. The regimes of upper hybrid frequency, lower hybrid frequency, ion cyclotron frequency, Alfven wave, and TTMP are covered. In each case the important parametric processes are discussed, including some work on the coupling to drift waves. Then recent experimental results which indicate the importance of parametric phenomena are presented.

46012 Hydromagnetic stability of tokamaks. Wesson, J.A. (UKAEA Research Group, Abingdon. Culham Lab.). *Nucl. Fusion;* **18**: No. 1, 87-132(1978).

A summary is given of the linear theory of the ideal and resistive hydromagnetic stability of tokamaks. The first section provides an introductory account of the various aspects of the stability problem, and the subsequent sections provide a survey of the subject and a review of the literature. For a perfectly conducting plasma the modes of instability are of three types: kink, internal, and axisymmetric. When resistivity is introduced the kink and internal modes have significantly modified forms. The analysis of the standard tokamak, having a large aspect ratio, circular cross-section and low β, is almost complete but the study of small aspect ratio, high-β configurations and the optimization of such configurations are at an early stage.

46013 Theory of hydromagnetic stability of a tokamak plasma. Zakharov, L.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). *Nucl. Fusion;* **18**: No. 3, 335-342(1978).

The author considers the stability of a plasma with a fixed boundary in a toroidal column of circular cross-section under the usual tokamak conditions and shows the effect of the non-local nature of the associated harmonics coupled with the fundamental mode. It is demonstrated that the stability conditions deteriorate with a rise in the pressure gradient, and this proves the inadequacy of the earlier known local criteria, according to which there is no instability when $q^2 > 1$.

46014 Theory of "drift" thermonuclear instabilities in a tokamak reactor. Mikhailovskii, A.B.; Frenkel', A.L. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 677-680(Nov 1977).

The drift (gradient) excitation of Alfven waves in a tokamak reactor by trapped α particles is analyzed. The bounce resonances between the wave and the particles are taken into account. The thresholds for the "drift" thermonuclear instabilities are calculated. Collisional dissipation by trapped electrons is studied as a stabilizing factor.

46015 Suppression of flute waves by a regulator with crossed feedback. Ladikov, Y.P.; Kravchenko, V.P.; Mashkovskii, A.G.; Tkachenko, V.F. (Institute of Cybernetics, Academy of Sciences of the Ukrainian SSR, Kiev). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 703-707(Nov 1977).

A theoretical analysis is presented of a flute wave suppression system that employs measurements of the perturbations of the electric potential by capacitive pickups. The two-fluid hydrodynamic model is used in the analysis.(AIP)

46016 Hydrodynamic Cerenkov instability of inhomogeneous plasma streams. Andreev, N.E.; Kirii, A.Y.; Panchenko, M.A.; Frolov, V.V. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 708-713(Nov 1977).

A theory is derived for a new effect: a spatial Cerenkov interaction of waves with an inhomogeneous plasma stream. Conditions are found for the growth of surface waves of the inhomogeneous plasma due to a resonant Cerenkov energy transfer from particles to the wave in a spatial region in which the wave phase velocity is equal to the stream velocity.

46017 Generation of harmonics of the pump wave and diagnostic of parametric turbulence. Bychenkov, V.Y.; Silin, V.P.; Tikhonchuk, V.T. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 730-735(Nov 1977).

A theory is derived for the generation of the harmonics $2\omega_0$, $(3/2)\ \omega_0$, and $(1/2)\ \omega_0$ through scattering of a pump wave by plasma waves. The spectral and angular distributions of harmonics and the coefficient of the conversion of the pump radiation into the harmonic are found. The cases of sharp focusing of a laser beam and a spherically symmetric irradiation of the target are treated. The theoretical estimates are compared with experimental data.

46018 Decay of an electromagnetic wave into two plasmons in an inhomogeneous plasma. Gusakov, E.Z.; Piliya, A.D.; Fedorov, V.I. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 739-744(Nov 1977).

The decay of an electromagnetic wave into two plasma waves in an inhomogeneous unmagnetized plasma is studied. The resulting instability is of an absolute nature in both collisional and collisionless plasmas. The instability threshold is found as a function of the damping rate of the plasma waves and the characteristic length of the inhomogeneity.

46019 Ionizational instabilities of an externally sustained discharge in air. Andreeva, M.N.; Persiantsev, I.G.; Pis'mennyi, V.D.; Polushkin, V.M.; Rakhimov, A.T.; Timofeev, M.A.; Treneva, E.G. (Scientific-Research Institute of Nuclear Physics, Moscow State University). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 770-774(Nov 1977).

An experimental study has been made of an externally sustained discharge in air at a pressure of 150 torr, controlled by an electron beam with an energy ~ 100 keV and a current density up to 200 $\mu A/cm^2$. An image converter, was used to study the conditions for the formation of striations and for the conversion of the homogeneous discharge into an arc. The results reveal several new types of ionizational instabilities, which occur at certain values of the plasma properties and the circuit parameters.

46020 Global instability of a nonequilibrium plasma slab. Kalmykova, S.S. (A. M. Gor'kii State University, Khar'kov). *Sov. Phys. - Tech. Phys. (Engl. Transl.);* **22**: No. 10, 1286-1287(Oct 1977).

The instability growth rate is calculated for a beam of charged particles injected into a "thick" slab. (AIP)

46021 Development of ionization instability in plasma with a variable direction of the mean current. Biberman, L.M.; Vinogradov, A.P.; Vorob'ev, V.S.; Filinov, V.S. (Institute of High Temperatures, Academy of Sciences of the USSR, Moscow). *Sov. Phys. - Dokl. (Engl. Transl.);* **22**: No. 10, 571-573(Oct 1977).

Two-dimensional calculations are performed demonstrate that a chaning current direction can partly or completely suppress the ionization instability of a low-temperature plasma.

46022 Interaction of fast electrons with hydromagnetic waves at a bounce resonance. Bespalov, P.A.; Grach, S.M.; Trakhtengerts, V.Y. (Scientific-Research Radiophysics Institute, Gor'kii). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 581-586(Sep 1977).

The excitation of fast magnetosonic waves in an adiabatic confinement system due to the resonant interaction of these waves with fast electrons bouncing between the mirror points is analyzed. Hydrodynamic or kinetic instabilities occur, depending on the nature of the distribution function. The thresholds and growth rates for these instabilities are determined. The possible amplitudes of the hydromagnetic waves are estimated. The formation of bunches of particles bouncing between the mirrors in the nonlinear stage of the instability is analyzed. The possibility that such bunches generate very low-frequency waves with spectra of the "chorus" type in the magnetosphere is discussed.

46023 Theory of electromagnetic instabilities in an inhomogeneous plasma stream with an anisotropic pressure. Rosinskii, S.E.; Rukhlin, V.G.; Soroka, A.M. (Moscow Institute of Radio Engineering, Electronics and Automation). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 587-591(Sep 1977).

Electromagnetic waves propagating at an angle with respect to the magnetic field in a finite-β plasma with hot electrons and cold ions are analyzed. The wave frequencies lie between the ion and electron gyrofrequencies. In the case of a slight anisotropy and a slow electron beam there is a resonant two-stream instability at a frequency near the whistler frequency. It is also found that a nonresonant two-stream instability occurs in the case of an isotropic plasma if the hydrodynamic pressure of the electron beam is higher than the magnetic pressure. Drift waves are analyzed for a slight anisotropy of the plasma temperature. The cold plasma component affects the drift—anisotropy and beam—anisotropy instabilities.

46024 Theory of electron trapping by plasma waves. Akhiezer, A.I.; Demutskii, V.P.; Polovin, R.V. (Physicotechnical Institute, Khar'kov). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 597-601(Sep 1977).

Exact equations are derived for the growth rate of plasma waves for the case in which electrons are trapped in potential wells of plasma waves (the Kruer—Dawson—Sudan instability mechanism) in the case of a low density of trapped particles and a small wave amplitude. The maximum wave growth rate is shown to be proportional to the effective plasma frequency of the trapped electrons, which is governed in turn by the zeroth and second components of the Fourier density of the trapped particles. An instability does not occur in the case of a δ-shaped trapped-particle density.

46025 Saturation of the parametric instability in a strong electromagnetic field. Andreev, N.E.; Silin, V.P.; Stenchikov, G.L. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 602-606(Sep 1977).

The Vlasov equation is solved numerically to study the relaxation of the electron and ion distributions during the development of the hydrodynamic resonant parametric instability, which occurs in a strong electromagnetic field (V/sub E/>>V/sub T/O). Comparison of the results with the results of the quasilinear theory shows that the mechanism studied here for the suppression of the instability, due to a resonant interaction of the bulk of the electrons with the quasi-one-dimensional perturbation field, is effective in a real three-dimensional situation.

46026 Modulational instability and nonlinear waves in a cold plasma. Kovrizhnykh, L.M. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 607-611(Sep 1977).

Nonlinear equations describing the one-dimensional electron—ion waves in a plasma are derived on the basis of two-fluid hydrodynamics. These equations hold for an arbitrary value of $U=E^2/4\pi nT$, the ratio of the wave energy density to the thermal energy density of the particles. These equations are used to study the modulational instability of a large-amplitude plasma wave and certain nonlinear solutions of the soliton type. In particular, it is shown that large-amplitude waves with $U=E^2/4\pi nT>3m$ are stable with respect to low-frequency waves. The conditions under which soliton solutions are possible are determined.

46027 Transition to the electron tearing mode. Gordeev, A.V. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 644-645(Sep 1977).

Two-dimensional calculations are presented for the dissipative tearing mode in a collisional plasma. The calculations are based on a the model of a current sheath according to which the magnetic field vanishes at x=0.

46028 Parametric excitation of nonlinear longitudinal waves in a magnetized plasma by an inhomogeneous electromagnetic field. Grishaev, V.I.; Demchenko, V.V. (Physicotechnical Institute, Academy of Sciences of the Ukrainian SSR Khar'kov and Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 645-647(Sep 1977).

Parametric effects in a homogeneous plasma subjected to an inhomogeneous electromagnetic field are studied theoretically.

46029 Effects of low frequency plasma waves on counter-streaming electron beam instability. Okutsu, E. (Tokyo Univ. of Education (Japan). Faculty of Science). *Jpn. J. Appl. Phys.;* **16**: No. 6, 1003-1008(Jun 1977).

Experimental investigations are made of a high frequency wave at one half the electron cyclotron frequency f sub(ce)/2 excited by counter streaming electron beams in a magnetoplasma. It is found that the time averaged amplitude of the high frequency wave is decreased by modulating the beam externally at a certain lower frequency. The result is explained qualitatively by considering that the low frequency wave causes a periodic change in the growth rate of the high frequency wave.

46030 Gradient B drift instability in toroidal systems. Dodo, T.; Okada, O. (Hitachi Ltd., Kokubunji, Tokyo (Japan). Central Research Lab.); Terashima, Y. *J. Phys. Soc. Jpn.;* **42**: No. 5, 1744-1751(May 1977).

A low frequency electrostatic instability in toroidal geometry is analysed with the two fluid equations. This instability is driven by the charge separation of plasma due to the toroidicity. The growth rate is largest when the parallel wave number is zero. This instability indicates as oscillation of poloidal mode numbers m=4, 3, 2 on the rational surfaces q=4, 3, 2 in tokamaks.

46031 Nonlinear development of the current-driven ion wave instability. Hara, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). *J. Phys. Soc. Jpn.;* **42**: No. 5, 1721-1729(May 1977).

An evolution of the current-driven ion wave instability is investigated experimentally. The linear properties of the instability are confirmed. The nonlinear evolution of the instability is studied. When the ratio of electron drift velocity to thermal velocity, v sub(d)/v sub(e) asymptotically equals 0.1, which is measured directly by the rotatable Langmuir probe, the turbulent power spectrum has a peak in the vicinity of νsub(1-n) and decreases monotonically as ωsup(-4.2+-0.4) with ω. From the scattering of the probing ion beam, it is found that the charged particles are resonantly scattered by the ion wave turbulence. The experimental results are compared with those from the perturbed orbit theory.

46032 Instability of the Trivelpiece mode in a magnetized beam-plasma system. Idehara, T.; Miyama, N.; Ishida, Y. (Fukui Univ. (Japan). Faculty of Engineering). *J. Phys. Soc. Jpn.;* **42**: No. 5, 1730-1736(May 1977).

Below the electron cyclotron frequency, spatially growing and damping waves are excited by the coaxial probe in a magnetized beam-plasma system. The former is the beam space charge wave amplified by a reactive-medium instability, because its characteristics are very similar to those of a beam wave excited by mesh-modulation of beam. While, the latter is considered to be the Trivelpiece mode of a magnetized plasma. The experimental results are compared with the theoretical consideration based on the dispersion relation of the mode.

PLASMA WAVE PHENOMENA

REFER ALSO TO CITATION(S) 46022

46033 (IPPJ—268) **Nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma.** Sanuki, H.; Ogino, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Dec 1976. 18p. Dep. NTIS (US Sales Only), PC A02/MF A01.

Nonlinear propagation of externally driven waves in the lower hybrid frequency range in an inhomogeneous plasma are investigated. The results of finite temperature, inhomogeneity of the plasma and density depression due to the ponderomotive force are emphasized since these effects are responsible for the propagation characteristics of the waves. The results shows that the waves are localized in a spatial wave packet that propagates into the plasma center along the conical trajectory which makes a small angle with respect to the confining magnetic field.

46034 (IPPJ—289) **Nonlinear self-modulation of ion-acoustic waves.** Ikezi, H.; Schwarzenegger, K.; Simons, A.L.; Ohsawa, Y.; Kamimura, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). May 1977. 47p. Dep. NTIS (US Sales Only), PC A03/MF A01.

The nonlinear evolution of an ion-acoustic wave packet is studied. Experimentally we find that (i) nonlinear phase-modulation develops in the wave packet; (ii) the phase-modulation, together with the dispersion effect, causes expansion, and breaking of the wave packet; (iii) the ions trapped in the troughs of the wave potential introduce self-phase-modulation, and (iv) the ion-acoustic wave is stable with respect to the modulational instability. Computer simulations have reproduced the experimental findings. The physical picture and the model equation describing the wave evolution are discussed.

46035 (IPPJ—291) **Measurements of dispersion relation of waves in a turbulently heated plasma by microwave scattering method.** Mase, A.; Tsukishima, T.; Iguchi, H.; Ito, Y.; Kawabe, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jun 1977. 14p. Dep. NTIS (US Sales Only), PC A02/MF A01.

The dispersion relation of the waves excited in a turbulently heated plasma has been studied by microwave scattering method, and it is identified to be that of the ion acoustic mode. The phase velocity of the wave has been observed to increase with time, indicating the increase of the electron temperature T sub(e) with time. A space-averaged density fluctuation, as evaluated from a microwave interferometric measurement, has shown to build up at about 0.8 μsec after the initiation of the heating discharge. The time when the density fluctuations saturate is found to correspond roughly to the time of the formation of a high energy tail in the ion distribution function observed in a previous experiment.

46036 (N—77-33980) **Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma.** Sugihara, R.; Midzuno, Y. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1976. 16p. (IPPJ—263). NTIS PC A02/MF A01.

Particle motion within one bounce period pi/omega sub B is considered when the cyclotron frequency omega sub C is comparable with omega sub B. The equation of motion with an approximation is solved analytically for certain initial values. The analytical solution thus obtained agrees quite well with numerically computed results over a wide range of omega sub C and omega sub B. It is shown that under some conditions the particle is accelerated quite efficiently as compared with that in an unmagnetized plasma.

46037 (N—77-33982) **Nonlinear propagation of the ordinary mode in a hot magnetoplasma.** Khiet, T.; Furutani, Y.; Ichikawa, Y.H. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Nov 1976. 35p. (IPPJ—265). NTIS PC A03/MF A01.

Kinetic theory of the self-modulation of a quasi-monochromatic ordinary wave propagating across an external magnetic field is presented. Explicit expressions of the dispersion and the nonlinear coupling coefficients are given for a Maxwellian plasma. In the limit of zero-temperature, a Karpman-Kruskal linear stability of the O-mode envelop is discussed.

46038 (N—77-33988) **Parametric decay of lower hybrid wave into drift waves.** Sanuki, H. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Dec 1976. 19p. (IPPJ—272). NTIS PC A02/MF A01.

The stimulated scattering of a drift Alfven wave in an inhomogeneous magnetized plasma was investigated. The resonance backscattering instability is found to yield the minimum threshold.

46039 (N—77-33992) **Contribution of higher order terms in the reductive perturbation theory. 2. A case of strongly dispersive wave.** Ichikawa, Y.H.; Mitsuhashi, T.; Konno, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jan 1977. 23p. (IPPJ—277). NTIS PC A02/MF A01.

Nonlinear modulation of a strongly dispersive ion plasma wave in a collisionless plasma composed of cold ions and warm electrons was analyzed to illustrate the higher order contributions of the reductive perturbation expansion in the strongly dispersive system. The basic set of fluid equations was reduced to a coupled set of the nonlinear Schrodinger equation for the first order perturbed potential and a linear inhomogeneous equation for the second order perturbed potential. A steady state solution of the coupled set of equations was solved analytically in the asymptotic limit of small wave number.

46040 (N—77-34003) **Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system.** Fukumasa, O.; Abe, H.; Itatani, R. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jul 1977. 18p. (IPPJ—295). NTIS PC A02/MF A01.

A nonlinear wave-particle interaction based on the single wave model is changed strongly by introducing small collisions into plasma electrons. These collisions are to small to change the linear stage. However, they alter the phase relation between the single wave and the trapped electrons in the nonlinear stage. As a result, the wave amplitude of the first minimum decreases anomalously and the persistent trapped particle oscillations in collisionless cases are destroyed.

46041 (N—77-34005) **Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves.** Ohsawa, Y.; Kamimura, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jul 1977. 29p. (IPPJ—297). NTIS PC A03/MF A01.

The nonlinear propagation of the wave packet of an ion acoustic wave with the electron Debye wavenumber is investigated by computer simulations. From the wave packet of the ion acoustic wave, waves with long wavelengths are observed to be produced within a few periods for the amplitude oscillation of the original wave packet. These waves are generated in the region where the original wave packet exists. Their characteristic wavelength is of the order of the length of the wave packet, and their propagation velocity is almost to the ion acoustic speed. The long-wavelength waves thus produced strongly affect the nonlinear evolution of the original wave packet.

46042 Scattering of drift waves by parametric interaction. Satya, Y.; Schmidt, G. (Stevens Institute of Technology, Hoboken, New Jersey 07030). *Phys. Fluids;* **21**: No. 8, 1312-1314(Aug 1978).

It is shown that the interaction of collisionless drift waves propagating in different directions can effectively exchange energy via interaction of a quasi-mode. The process is nonlinear electron Landau damping, and may explain the near isotropic distribution of drift waves in tokamak experiments.

46043 Space-time approach to the Vlasov—Poisson equations. Manley, O.P. (Division of Magnetic Fusion Energy, Department of Energy, Washington, D. C. 20545). *Phys. Fluids;* **21**: No. 8, 1445-1447(Aug 1978).

A nonlinear Klein—Gordon equation equivalent to the Vlasov—Poisson equations is derived. It places in evidence the explicit nature of the nonlinearities inherent in the simplest nontrivial plasma model, viz., the one-dimensional electron gas.

46044 Simulation study of Bernstein modes. Kamimura, T.; Wagner, T.; Dawson, J.M. (Department of Physics, University of California, Los Angeles, California 90024). *Phys. Fluids;* **21**: No. 7, 1151-1167(Jul 1978).

The properties of Bernstein modes were investigated through computer simulations using two-dimensional and two-and-one-half-dimensional (i.e., two spatial and three velocity coordinates) electrostatic models with fixed magnetic field. The measured discrete spectrum was found to agree with the linear dispersion relation for these modes. The quasi-periodic phenomenon of early phase-mixing damping and later recurrence, predicted by Baldwin and Rowlands, was observed. For large wavenumber k/sub perpendicular/, the initial damping rate is the same as that for Landau damping in an unmagnetized plasma; for small k/sub perpendicular/, however, it is much stronger. The recurrence peaks slowly damp in time at a rate proportional to k²/sub perpendicular/D, where D is the measured cross-field particle diffusion coefficient which is dominated by convective transport. Finally, splitting of the main spectral peaks and the appearance of subpeaks at half-integral multiples of the cyclotron frequency are observed and may be explained by nonlinear mode coupling.

46045 Doppler model for adiabatic toroidal compressor driftwave frequency profiles. Koch, R.A.; Tang, W.M. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08540). *Phys. Fluids;* **21**: No. 7, 1236-1238(Jul 1978).

Microwave and CO_2 laser scattering experiments on the ATC adiabatic toroidal compressor tokamak have shown that there exists a spectrum of fluctuations with frequencies vertical-barfvertical-bar< or ≈1 MHz at wavelengths λ~0.28 cm and with vertical-barfvertical-bar< or ≈400 kHz for λ~1 cm. However, a typical maximum frequency calculated for given experimental density and temperature profiles is f< or ≈150 kHz for the longer wavelengths and differs from the experimental results by roughly a factor of 2 or 3. At shorter wavelengths the calculated maximum f< or ≈100 kHz, which differs quite substantially from the experimental result. This discrepancy is interpreted as evidence of an E x B Doppler shift from a radial electric field.

46046 Coupling to fast eigenmodes in a non-uniform plasma. Paoloni, F.J. (Princeton Univ., N.J. (USA). Plasma Physics Lab.). *Nucl. Fusion;* **18**: No. 3, 359-366(1978).

The dispersion relation and fields of fast magnetosonic waves in a pure deuterium plasma are calculated by using a model that includes the electron mass in the cold-plasma dielectric tensor and a cylindrically symmetric non-uniform density. If the attenuation is small, coupling of antennas to column resonances, or eigenmodes, can be described by two terms - one determined by geometrical factors and the other one by the damping within the cavity. This paper presents calculations of geometrical coupling factors for a quarter-turn loop and for a waveguide suitable for present-day tokamak conditions. The method allows for a systematic representation of coupling to the many different possible eigenmodes, independently of the damping mechanism.

46047 Interaction of lower hybrid waves with turbulent tokamak plasma. Parail, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). *Nucl. Fusion;* **18**: No. 3, 343-351(1978).

Processes of resonance interaction of lower hybrid waves with low-frequency oscillations excited in the plasma by longitudinal current and inhomogeneity are discussed. It is shown that the existence of a low-frequency turbulence in a tokamak plasma may appreciably reduce the attenuation length of lower hybrid waves owing to decay processes. The existence of drift oscillations in the plasma must lead to blocking and subsequent accumulation of lower hybrid waves on the periphery of the plasma column.

46048 Three-dimensional effects in the non-linear propagation of lower-hybrid waves. Sen, A.; Karney, C.F.F.; Johnston, G.L.; Bers, A. (Massachusetts Inst. of Tech., Cambridge (USA). Research Lab. of Electronics). *Nucl. Fusion;* **18**: No. 2, 171-179(1978).

Self-modulation effects can become important for the propagation of lower hybrid waves in plasma, particularly for the high power levels envisioned in r.f. heating schemes. Earlier studies in two dimensions (in the plane defined by the electric field of the pump wave and the background magnetic field) have led to nonlinear propagation equations, such as the MKdV or the non-linear Schroedinger equation, which admit multiple-soliton solutions. These could physically manifest themselves by breaking up the resonance cones into filaments with intense localized electric fields and could further lead to localized heating. This problem is studied in three dimensions with the motivation of including two additional physical factors. First, the non-linear effect arising from the E vectorxB vector motion of electrons is included; this leads to an enhancement in the threshold value for the formation of solitons. Secondly, the stability of the two-dimensional solitons to perturbations in the third dimension is studied, and it is found that the third dimension introduces additional dispersive effects which render the solitons unstable to these perturbations.

46049 Effect of an electron beam on pump-driven quasi-modes. Sinha, M.; Sundaram, A.K. (Physical Research Lab., Ahmedabad (India)). *Nucl. Fusion;* **18**: No. 2, 199-203(1978).

It is shown theoretically that an electron beam injected into a plasma can substantially modify the dispersion characteristics of lower-hybrid pump-driven quasi-modes, ultimately enhancing in this way the efficiency of plasma heating.

46050 Filamentation of lower-hybrid cones. Spatschek, K.H. (Essen Univ., Fachbereich Physik, Germany, F.R.); Shukla, P.K.; Yu, M.Y. (Bochum Univ. (Germany, F.R.). Inst. fuer Theoretische Physik). *Nucl. Fusion;* **18**: No. 2, 290-293(1978).

Letter-to-the-editor.

The interaction of large-amplitude lower-hybrid waves with finite-frequency density perturbations is considered. The non-linear equation which governs the asymptotic state of the filamentation admits moving solitary envelope solutions for the electric field.

46051 Absorption coefficient of a magnetized plasma for cyclotron radiation. Tamor, S. (Science Applications, Inc., La Jolla, Calif. (USA)). *Nucl. Fusion;* **18**: No. 2, 229-241(1978).

The interaction of cyclotron radiation with a relativistic Maxwellian plasma has been re-examined with the aim of developing a computational method which will be useful for the range of parameters of interest in tokamak studies. A suitable method and the resulting computer code are briefly sketched. A sampling of results is presented and compared with previously published approximate results. A discrepancy in the ordinary-wave interaction at 90° propagation is pointed out. A simple model is discussed which permits easy extension of the computational method to include runaway electrons, and illustrative results are presented.

46052 Relativistic effects on electromagnetic wave propagation in a cold inhomogeneous electron plasma. Bourdier, A.; Babonneau, D.; di Bona, G.; Fortin, X. (Commissariat a l'Energie Atomique, Centre d'Etudes de Limeil, Villeneuve-St. Georges, France). *Phys. Lett., A;* **64**: No. 3, 292-294(26 Dec 1977).

A method which permits investigation of the propagation of a travelling wave in different cases is constructed. The results obtained in the case of an inhomogeneous plasma, taking into account relativistic effects, are presented.

46053 Ion wave excitation by radiation pressure in a plasma waveguide. Sugai, H.; Maruyama, M.; Sato, M.; Takeda, S. (Nagoya Univ. (Japan)). *Phys. Lett., A;* **64**: No. 3, 295-297(26 Dec 1977).

After turn-off of high-power pulsed microwaves, a large-amplitude ion wave is generated which has half of the wavelength of the guided wave. The electomagnetic radiation pressure is responsible for the excitation of the ion acoustic wave.

46054 Equation of polarization transfer in an inhomogeneous magnetized plasma. II. Solutions. Fung, P.C.W.; Cheng, F.T. (Hong Kong Univ.). *Astrophys. Space Sci.;* **52**: No. 2, 243-264(Dec 1977).

Following the formalism of the polarization transfer equation presented recently by the same authors, solutions to this transfer equation under several special cases of interest are discussed in this paper. Analytic solutions for the Stokes parameters for several special cases of interest are given, and numerical solutions to these parameters for arbitrary propagation direction and two types of inhomogeneity of the medium are presented.

46055 Non-linear scattering probability of longitudinal plasma waves in a magnetoactive plasma system. Fung, P.C.W.; Ko, K.C.C. (Hong Kong Univ.). *Astrophys. Space Sci.;* **52**: No. 1, 105-135(Nov 1977).

The semi-quantum approach is used to study the Compton scattering and non-linear scattering processes in a magnetoactive plasma under the weak turbulence regime. Analytical expressions for these two types of scattering probabilities are derived from first principles for l-l waves. Transiting to limiting cases, the results obtained in this investigation are shown to be identical to previous derivations by other workers.

46056 Electron density balance and stabilization of wave profile. Kogan, E.Y.; Martysh, E.V. (T. G. Shevchenko Kiev State University, Kiev). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 466-467(Nov 1977).

The charged-particle density in a stationary plasma wave is studied theoretically as a function of electron temperature and temperature gradients.

46057 Higher-harmonic generation in a plasma excited at the lower hybrid frequency. Khorasanov, L.G.; Elfimov, A.G.; Sidorova, I.K. (Sukhumi Physicotechnical Institute). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 470-471(Nov 1977).

A Langmuir probe was employed to detect higher-harmonic plasma waves in a TsU-5 device.

46058 Generation of (3/2) ω_0 in a laser-produced plasma. Gusakov, E.Z. (A. F. Ioffe Physicotechnical Institute, Academy of Sciences of the USSR, Leningrad). *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 11, 504-505(Nov 1977).

The coefficient of energy conversion from plasma waves to harmonics is calculated for a laser-produced inhomogeneous plasma below the threshold for the absolute instability.

46059 Evolution of slightly localized Alfven quasimodes in a two-component tokamak. Bardakov, V.M. (Institute of Terresterial Magnetism, the Ionosphere, and Radio Wave Propagation, Siberian Branch, Academy of Sciences of the USSR). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 673-674(Nov 1977).

A simple method is proposed for calculating the evolution of unstable perturbations in an inhomogeneous plasma for the case in which the quasiclassical approximation cannot be used. The method is illustrated for the case of the evolution of Alfven waves in a two-component tokamak.

46060 Suppression of the Alfven instability in a two-component tokamak of noncircular cross section. Mazur, V.A.; Mikhailovskii, A.B. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 675-676(Nov 1977).

The stabilizing role played by trapped electrons and background ions in the excitation of Alfven waves in a two-component tokamak of noncircular cross section is studied. The electron and ion damping rates for Alfven waves in a noncircular tokamak are calculated. At a sufficiently high plasma pressure, the noncircular nature of the tokamak cross section strongly affects the ion damping rate for these waves. A condition for the stabilization of Alfven waves by background ions is derived for two-component tokamaks with cross sections which are "very elliptical" or "very triangular."

46061 Effect of refraction on the propagation of magnetosonic waves in an inhomogeneous plasma. Ruderman, M.S. (Institute of Cosmic Studies, Academy of Sciences of the USSR). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 681-687(Nov 1977).

The propagation of nonlinear magnetosonic waves in an inhomogeneous plasma is analyzed in the hydrodynamic approximation. Hall dispersion and Joule heating are taken into account. The problem breaks up into two parts. The first part involves solution of the eikonal equation, so that the rays of the group-velocity vector can be found. In the second part, a generalized Korteweg—de Vries—Burgers equation is solved along each ray. Attention is focused on the wave propagation in a plane stratified medium. A study is made of waves which are propagating in a plane which contains an inhomogeneity gradient and perpendicular to a plane passing through the inhomogeneity gradient and the magnetic induction. It is shown that for this case a caustic does not form in slow magnetosonic waves. The propagation of quasisimple and cnoidal waves with slowly varying parameters is studied in the limit of a cold plasma and an isothermal atmosphere. It is shown that in this limit the slow magnetosonic waves are not refracted. For fast magnetosonic waves, the distance over which the quasisimple wave breaks is studied as a function of α, the angle between the inhomogeneity gradient and the magnetic induction; psi, the angle between the eikonal gradient and the inhomogeneity gradient; r, the ratio of the breaking distance in a homogeneous medium to the scale height. It is found that the wave does not break before the caustic is crossed over broad ranges of α, psi, and r. For a cnoidal wave, the parameter describing the deviation from a sinusoidal function is studied as a function of x, the distance traversed by the cnoidal wave along the inhomogeneity gradient, for various values of α and psi. Near the caustic the cnoidal wave converts into a train of solitons. The changes in the amplitudes along x for a sinusoidal wave and for a soliton are compared. It is shown that the inhomogeneity has a stronger effect on the soliton than on the sinusoidal wave.

46062 Steady-State nonlinear waves in a plasma with a modulated electron beam. Kovalenko, V.P.; Yushmanov, P.N. (Institute of Physics, Academy of Sciences of the Ukrainian SSR). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 714-716(Nov 1977).

The conditions for an equilibrium state of electron bunches moving in a plasma are found. This equilibrium state turns out ot be possible in a nonlinear wave because the plasma-wave field compressed by these bunches is opposed by either the field produced by the bunches themselves or the electron kinetic pressure. The steady-state wave found is unstable with respect to the excitation of plasma waves, but under certain conditions the instability growth rate can be much smaller than in the case of an unmodulated beam.

46063 Nonlinear charge-density waves in a bounded magnetized plasma. Lukomskii, V.P. (Institute of Physics, Academy of Sciences of the Ukrainian SSR). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 717-718(Nov 1977).

The propagation of slightly nonlinear electron-density waves in a waveguide filled with a magnetized plasma is analyzed. It is assumed that the nonlinearity, the dispersion, and the dissipation are slight. Then the original nonlinear system of Vlasov—Poisson equations is reduced to a system of evolutionary equations of the Korteweg—de Vries type for the amplitudes of the waveguide modes. This system has a nonlocal term describing collisionless damping. In the case in which there is no mode degeneracy it is found that for only certain of these modes does a finite initial perturbation evolve to Korteweg—de Vries solitons. The conditions for soliton amplification in the beam—plasma system are discussed.

46064 Nonlinear transmission and reflection of electromagnetic waves obliquely incident on a plasma slab. II. Waves of different polarization. Romanov, Y.A.; Dryakhlushin, V.F. (Gor'kii Scientific-

Research Physicotechnical Institute). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 719-723(Nov 1977).

The nonlinear transmission and reflection of electromagnetic waves of different polarization which are incident obliquely on a plasma slab are studied. The effect is of second order in the field of incident waves and is due to the excitation of electromagnetic echo waves near the slab boundaries. The analysis is carried out for the cases of specular and quasidiffuse reflection of the electrons from the boundaries. The transmitted and reflected waves which are excited are of polarization s. The amplitudes of these waves are found. The results are compared with results found earlier for the case in which the two incident waves have the same polarization.

46065 Nonlinear reflection of an intense electromagnetic wave from a dense plasma slab. Sauer, K.; Gorbunov, L.M. (P. N. Lebedev Physics Institute, Academy of Sciences of the USSR, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 724-730(Nov 1977).

The nonlinear reflection of an intense electromagnetic wave incident normally on a dense plasma slab is studied numerically and analytically. The hysteresis of the reflection is discussed.

46066 Excitation of an ion—acoustic soliton by high-frequency waves in a collisionless plasma with a two-temperature electron gas. Pataraya, A.D.; Chagelishvili, G.D. (Abasturman Astrophysical Observatory and Institute of Physics, Academy of Sciences of the Georgian SSR, Tbilisi). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 736-738(Nov 1977).

Nonlinear waves are studied in a plasma with cold ions and hot electrons with two temperatures. A small concentration of the cooler electron component leads to effects qualitatively different from those obtained in a plasma with an electron gas at a single temperature. A hydrodynamic equation for a plasma with a two-temperature electron gas, averaged over the fast time (the reciprocal of the electron plasma frequency), is derived. The profile is found of the ion—acoustic soliton caused by the ponderomotive force of the high-frequency (longitudinal and transverse) field and the nonlinear term of the low-frequency field. For certain values of the electron properties, the high-frequency field does not excite an ion—acoustic soliton. The case of large-amplitude ion—acoustic soliton is studied. Depending on the plasma proper ies, there is a soliton with a positive or negative electrostatic field amplittude. For certain values of the plasma properties, as the Mach number increases are ejected from the central hot electrons region of the soliton, and the process tends toward the formation of two solitons.

46067 Langmuir solitions in an inhomogeneous plasma. Chukbar, K.V.; Yan'kov, V.V. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 780-782(Nov 1977).

The acceleration of solitons is analyzed using the Zakharov equations.

46068 Excitation of ion—acoustic waves in an inhomogeneous plasma by a train of rf pulses. Gradov, O.M.; Izmailov, G.N. *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 6, 782-783(Nov 1977).

It is shown that the amplitudes of ion acoustic waves in a plasma slab will increase exponentially if the incident rf pulses are synchronized with the resonant electrostatic waves of the plasma.

46069 Numerical investigation of the collapse of Langmuir waves in a magnetic field. Lipatov, A.S. (Institute of Space Research, USSR Academy of Sciences). *JETP Lett. (USSR) (Engl. Transl.);* **26**: No. 7, 377-380(5 Oct 1977).

The existence of a collapse of Langmuir waves in a magnetic field, for an initial electric-field distribution in the form of a dipole caviton, is established on the basis of a numerical experiment.

46070 Observation of nonelectrostatic rf noise in the T-4 tokamak. Ivanov, N.V.; Kovan, I.A.; Semenov, I.B. (I. V. Kurchatov Institute of Atomic Energy, Moscow). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 526-527(Sep 1977).

Oscillations of the poloidal magnetic field at the plasma boundary are observed in the frequency range 0.15—2.0 MHz in the T-4 tokamak. It is suggested that these oscillations may be related to an Alfven-wave instability in the plasma interior.

46071 Nonlinear transmission and reflection of electromagnetic waves of identical polarization which are incident obliquely on a plasma slab. Romanov, Y.A.; Dryakhlushin, V.F. (Scientific-Research Physicotechnical Institute, Gor'kii). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 612-618(Sep 1977).

The nonlinear transmission and reflection of two transverse electromagnetic waves of identical polarization (s or p) which are incident obliquely on an isotropic plasma slab are studied. If the frequency and wavevector of one of the incident waves are multiples of those of the other, there are nonlinear reflected and/or transmitted waves of polarization p at the difference frequency, for both polarizations. This effect is of second order in the field of the incident waves and is due to the appearance of echo currents near the slab boundaries. The analysis is based on the classical kinetic equation for specular, quasispecular, and quasidiffuse reflection of electrons from the slab boundaries.

46072 Threshold for the absolute instability of stimulated Brillouin scattering in a plasma with density and temperature gradients. Andreev, A.A. (S. I. Vavilov State Optics Institute). *Sov. J. Plasma Phys. (Engl. Transl.);* **3**: No. 5, 647-649(Sep 1977).

The effect of a temperature gradient on the decay of an electromagnetic pump wave is examined.

46073 High-frequency plasma waves in a Hall accelerator with an extended acceleration zone. Tilinin, G.N. *Sov. Phys. - Tech. Phys. (Engl. Transl.);* **22**: No. 8, 974-978(Aug 1977).

The spectrum of high-frequency plasma waves is studied in a Hall accelerator with an extended acceleration zone. The spectrum is sensitive to the magnetic field and a rapid variation of wave amplitude along the accelerator channel is observed. These effects are correlated with the discharge conditions and the "low-frequency" processes that occur.

46074 Collapse of Alfven waves. Erokhin, N.S.; Moiseev, S.S.; Mukhin, V.V. *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 7, 258-259(Jul 1977).

The growth rates are calculated for the collapse of Alfven waves in a low-β plasma. The relationship to rf heating is discussed.(AIP)

46075 Absorption of the lower-hybrid wave in a bounded plasma. Parail, V.V.; Shafranov, T.V. *Sov. Tech. Phys. Lett. (Engl. Transl.);* **3**: No. 7, 262-263(Jul 1977).

It is shown that in a bounded inhomogeneous plasma most of the energy of lower-hybrid waves is lost through Landau damping.(AIP)

46076 Experimental study of excitation of low frequency plasma waves by amplitude-modulated microwave. Sakamoto, Y. (Institute of Physical and Chemical Research, Wako, Saitama (Japan)). *Jpn. J. Appl. Phys.;* **16**: No. 6, 1015-1024(Jun 1977).

Effective excitation of plasma waves by an amplitude-modulated microwave (4.4 GHz, 1 kW) is presented in a highly ionized magnetoplasma. The electric field of the excited waves which is proportional to the square of the microwave field has the maximum value of 30 V/cm. The ponderomotive force may be mainly responsible for the excitation. The excited three waves seem to be, in the experimental frequency range at least, a drift wave, a transition mode wave from the shear Alfven to the electron-cyclotron waves and a low frequency electro-acoustic wave.

46077 Stationary spectra of high-frequency oscillations of a plasma in a magnetic field. Breizman, B.N.; Malkin, V.M.; Sobolev, O.P. (Institute of Nuclear Physics, Siberian Division, USSR Academy of Sciences). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 935-942(May 1977).

We consider weak turbulence of Langmuir and electromagnetic waves, the source of which is a beam of relativistic electrons. We take into account the processes of induced scattering of the waves by the ions in the plasma and the damping of the waves due to Coulomb collisions. We find for the case of a weak magnetic field (ω/sub He/very-much-less-thanω/sub pe/) stationary turbulence spectra and we calculate the power transferred from the beam to the plasma. We show that the threshold heating power at which a condensation of energy into the long-wavelength part of the spectrum begins increases linearly with increasing magnetic field.

46078 Finite amplitude Langmuir oscillations in the plasma resonance region. Bulanov, S.V.; Kovrizhnykh, L.M.; Sakharov, A.S. (P. N. Lebedev Physical Institute, USSR Academy of Sciences). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 949-957(May 1977).

We consider, in the multi-fluid hydrodynamical approximation, induced Langmuir oscillations of an inhomogeneous plane plasma layer in an external harmonic hf field. We study the limitation of the electric field amplitude near the plasma resonance point as the result of a linear transformation into plasma waves, the self-intersection of electron trajectories, the anharmonicity of the Langmuir oscillations, and the non-stationarity of the plasma for various density profiles. We study numerically the generation of non-linear plasma waves and the acceleration of particles when resonance break down takes place which leads to an effective dissipation of the energy of the oscillations in the resonance region. We analyze qualitatively the role of the ion motion which is the result of striction forces and we indicate conditions under which modulational, parametric, and other instabilities which are connected with ion motion turn out to be unimportant.

46079 Bremsstrahlung of relativistic electrons in a plasma in a strong magnetic field. Akopyan, A.V.; Tsytovich, V.N. (Institute of Radiophysics and Electronics, Armenian Academy of Sciences). *Sov. Phys. - JETP (Engl. Transl.);* **45**: No. 5, 957-962(May 1977).

The bremsstrahlung of relativistic electrons in a plasma in a strong magnetic field is considered, with effects of dynamic screening and of a new mechanism of transition bremsstrahlung [A. V. Akopyan and V. N. Tsytovich, Zh. Eksp. Teor. Fiz. 71, 166 (1976) [Sov. Phys. JETP 44, 87 (1977)] taken into account. It is shown that in a strong magnetic field the effects of dynamic screening strongly diminish the intensity of ordinary bremsstrahlung at high frequencies $\omega < \omega/\text{sub m/ax}$; here $\omega/\text{sub m/ax} = 2\delta^2\omega$, where $\omega = \omega/\text{sub p/ec/v/sub T/e}$, $\omega/\text{sub p/e}$ is the electronic plasma frequency, $\delta/ = \epsilon/\text{m/sub e/c72}$, ϵ is the energy of the relativistic electron, and v/sub Te/ is the mean thermal velocity of the plasma electrons (v/sub T/every-much-less-thanc). The angular distribution of the bremsstrahlung spectral intensity and the total intensity are studied in detail, both for the usual bremsstrahlung mechanism and for transition bremsstrahlung.

46080 Electron-flux limitation due to ion acoustic instability. Yabe, T.; Niu, K. (Tokyo Inst. of Tech. (Japan)). *Reza Kenkyu;* **4**: No. 4, 51-57(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

The new flux-limited theory including the ion-wave effects is presented. Preliminary results of the two-dimensional particle simulations support this theory.

FUSION POWER PLANT TECHNOLOGY

46081 (COO—4181-1) **Economics of fusion research.** (ECON, Inc., Princeton, N.J. (USA)). 15 Oct 1977. Contract EG-77-C-02-4181. 288p. (ECON—77-158-2). Dep. NTIS, PC A13/MF A01.

This report provides the results of a study of methods of economic analysis applied to the evaluation of fusion research. The study recognizes that a hierarchy of economic analyses of research programs exists: standard benefit-cost analysis, expected value of R and D information, and expected utility analysis. It is shown that standard benefit-cost analysis, as commonly applied to research programs, is inadequate for the evaluation of a high technology research effort such as fusion research. A methodology for performing an expected value analysis is developed and demonstrated and an overview of an approach to perform an expected utility analysis of fusion research is presented. In addition, a potential benefit of fusion research, not previously identified, is discussed and rough estimates of its magnitude are presented. This benefit deals with the effect of a fusion research program on optimal fossil fuel consumption patterns. The results of this study indicate that it is both appropriate and possible to perform an expected value analysis of fusion research in order to assess the economics of a fusion research program. The results indicate further that the major area of benefits of fusion research is likely due to the impact of a fusion research program on optimal fossil fuel consumption patterns and it is recommended that this benefit be included in future assessments of fusion research economics.

46082 (LA—7125-MS) **Summary of Syllac results.** Siemon, R.E. (Los Alamos Scientific Lab., N.Mex. (USA)). Apr 1978. Contract W-7405-ENG-36. 29p. Dep. NTIS, PC A03/MF A01.

A series of theta-pinch high-beta stellarator experiments has been recently completed. They demonstrated the existence of a toroidal equilibrium at high beta (about 70%) and reveal the expected instability of gross plasma motion. Feedback stabilization, by means of optical sensors for plasma position coupled to current amplifiers for magnetic field control, works effectively to keep the plasma column near the center of the discharge vessel. Confinement of plasma in the recent feedback experiments is limited by classical end losses associated with the finite-length toroidal sectors. This document gives a simplified history of Scyllac much as it was presented in an invited paper at the 1977 Plasma Physics Division meeting of the American Physical Society held in Atlanta, Georgia.

46083 (N—77-34000) **Alternative approaches to plasma confinement.** Roth, J.R. (National Aeronautics and Space Administration, Cleveland, Ohio (USA). Lewis Research Center). May 1977. 79p. (NASA-TM-X—73793; E—9361). NTIS PC A05/MF A01.

The potential applications of fusion reactors, the desirable properties of reactors intended for various applications, and the limitations of the Tokamak concept are discussed. The principles and characteristics of 20 distinct alternative confinement concepts are described, each of which may be an alternative to the Tokamak. The devices are classed as Tokamak-like, stellarator-like, mirror machines, bumpy tori, electrostatically assisted, migma concept, and wall-confined plasma.

46084 (ORNL/Sub—7117/24) **TNS engineering trade study analysis.** Chapin, D.L.; Gibson, G. (Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Fusion Power Systems Dept.). 30 Sep 1977. Contract W-7405-ENG-26. 65p. Dep. NTIS, PC A04/MF A01.

The computer code, ground rules, and plasma scalings used in the trade studies are briefly discussed. The results of these analyses are presented in detail. The results are summarized and pertinent conclusions and recommendations regarding the TNS design options are discussed. (MOW)

46085 (ORNL/Sub—7117/25) **Four ignition TNS tokamak reactor systems: design summary.** Flanagan, C.A. (ed.). (Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Fusion Power Systems Dept.). Oct 1977. Contract W-7405-ENG-26. 178p. (WFPS-TME—071). Dep. NTIS, PC A09/MF A01.

Principal TNS objectives assumed included: (1) demonstration of ignition and burning dynamics; and (2) reactor technology forcing. The selection of an overall design approach for TNS required an early quantitative assessment of the most important design issues; namely, choice of ignition plasma design conditions (principally size and confining field of axis), and choice of toroidal field coil technology (resistive or superconducting windings). The design space investigated in this study ranged from ignited plasmas (elongated) with minor radii varying between 0.8 m (TFTR-like) and approximately 2.0 m (EPR-like). Four TF coil types were examined; these included copper, NbTi, Nb_3Sn, and a hybrid design employing nested coils of copper and NbTi. A final step involved a further comparison of the four reference concepts using decision modeling techniques as a mechanism for selecting a preferred design approach for the TNS mission. Section 3.0 describes the TNS study process. Section 4.0 presents a summary of the parameters for the four reference point designs. Finally, Section 5.0 presents a brief description of the design features of many of the systems comprising the TNS design.

46086 (UCRL—13834) **Evaluation and recommendations on U.C. Lawrence Livermore Labortory Quality Assurance Program.** Carpenter, F.D.; Horner, M.H. (General Atomic Co., San Diego, Calif. (USA)). 12 Apr 1978. Contract W-7405-ENG-48. 36p. Dep. NTIS, PC A03/MF A01.

A study was conducted of the University of California's Lawrence Livermore Laboratory Quality Assurance Program, which focused on training needs and recommendations tailored to the various on-going programs. Specific attention was directed to an assessment of the quality status for the MFTF facility and the capabilities of assigned quality project engineers. Conclusions and recommendations are presented which not only address the purpose of this study, but extend into other areas to provide insight and needs for a total cost effective application of a quality assurance program.

46087 Status report on controlled thermonuclear fusion by International Fusion Research Council (IFRC). *Nucl. Fusion;* **18**: No. 1, 137-149(1978).

The current status and prospects for fusion are presented. It is recommended to IAEA international initiatives to help establish the fusion option.

46088 Recent stellarator research. Miyamoto, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). *Nucl. Fusion;* **18**: No. 2, 243-284(1978).

This paper intends to review recent stellarator research in various laboratories. Efforts are continuously and actively being made to improve the confinement of plasmas in stellarator fields. Advances in confinement theory are summarized. Experimental results concerning Ohmically heated plasmas as well as currentless plasmas are reviewed. Finally, stellarator reactor studies are briefly introduced.

46089 Who works with nuclear fusion technology. Demands of the technological development on the training. Boettiger, H. pp 39-42 of Konferenz ueber Energie und technologische Entwicklung: die Loesung der Energiekrise. Wiesbaden, Germany, F.R.; Campaigner Verl. (1977). (In German)

From Conference on energy and technological development) solution to the energy crisis; Essen, F.R. Germany (6 Jun 1977).

Humanity today, and especially the youth in industrial nations, undergoes a trend towards a 'post-industrial society'. This may be due to the resignation of those who think themselves unable to meet the increasing demands made on social production. The paper draws up a concept to give humanity a new interest in life. First, the paradox educational situation in the FRG today is outlined. Nuclear fusion technology and the industrial development necessary for its implementation are offered as a way out of the paradox situation of the present educational system. The demands to be made on an educational system for fusion technology are discussed. This strategy for world-wide economic growth integrates the intelligence potential of the industrial nations and the potential labour force of the Third World.

BLANKET ENGINEERING

REFER ALSO TO CITATION(S) 44734

46090 (HMI-B—235) **Calculation of the influence of a thermal shield on the neutron flux and on the tritium production in a fusion reactor blanket.** Schneider, J. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Kernchemie und Reaktor). Apr 1977. 59p. (In German). Dep. NTIS (US Sales Only), PC A04/MF A01.

This paper has the objective to study the influence of a lithium-6 and lithium-7 material mixture as a shielding layer for the steel shell of the blanket module. The main objective of the study is to retain an advantageous tritium breeding rate (> 1.0 per fusion neutron) while at the same time reducing the thermal neutron flow in the structural material.

46091 **Energy loss to the wall and limiter in normal ORMAK discharges.** Edmonds, P.H.; England, A.C. (Oak Ridge National Lab., Tenn. (USA)). *Nucl. Fusion;* **18**: No. 1, 23-27(1978).

Measurements of temperature rise of the wall and of a movable limiter have been made in the Oak Ridge Tokamak (ORMAK). For a normal discharge without injection, approximately 70% of the energy in the discharge is deposited on the wall. Very little energy is deposited on a point limiter until it is moved several centimeters inside the circular limiter, indicating that the body of the plasma is not in contact with the limiter and that diffusion and heat conduction do not transfer a large fraction of the plasma energy to the limiter.

46092 **Possibility of wall-protecting cold-plasma layer formation in a tokamak reactor.** Igitkhanov, Yu.L.; Kukushkin, A.S.; Stakhanov, I.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). *Nucl. Fusion;* **18**: No. 3, 415-420(1978).

Letter-to-the-editor.

It is shown that, on the assumption of neoclassical transport processes, a stationary regime of thermonuclear reactions in a thermonuclear reactor is possible, in which case, in the region close to the wall, a protective layer of dense, cold plasma capable of protecting the wall from sputtering is formed.

46093 **Shielding problems in the FINTOR design.** Nicks, R.; Ponti, C.; Realini, G.; Van Heusden, R. (Euratom, Ispra, Italy). pp 512-519 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

This paper briefly discusses the neutron and gamma shielding studies in the FINTOR-I experimental reactor. The main features of the FINTOR-I reactor and the functions of its main components are summarized. The major shielding problems identified at the conceptual design stage are related to the superconducting magnets; they concern heat deposition in the cryogenic zone as well as radiation damage to the copper stabilizer. The evaluation of the above mentioned quantities requires an adequate calculation of the radiation field in the bulk shield and along the different streaming paths. The results of these calculations indicate that the bulk shield performance is adequate whereas the streaming paths introduced by some of the plant components, generate locally excessive radiation levels. The more severe problem, still to be solved, is the radiation damage to the divertor coils.

46094 **Optimal iron-water shields for fusion reactors.** Gilai, D. (Nuclear Research Center, Beer Sheva, Israel); Greenspan, E.; Levin, P.; Price, W.G. Jr. pp 731-738 of Reactor shielding. Roussin, R.W.; Abbott, L.S.; Bartine, D.E. (eds.). Princeton, NJ; Science Press (1977).

From 5. international conference on reactor shielding; Knoxville, TN, USA (18 Apr 1977).

See CONF-770401—.

Optimal compositions of iron-water shields which minimize different radiation effects in the superconducting coils of fusion reactors are determined. Functional relations between the minima of atom displacements, doses and heat deposition, and between the shield thickness are found. A new optimization formulation, based on second order perturbation theory has been developed and incorporated in SWAN.

MAGNET COILS AND FIELDS

REFER ALSO TO CITATION(S) 46084

46095 (JAERI-M—7062) **Three-dimensional analysis of eddy current with the finite element method.** Takano, I.; Suzuki, Y. (Japan Atomic Energy Research Inst., Tokyo). May 1977. 86p. (In Japanese). Dep. NTIS (US Sales Only), PC A05/MF A01.

The finite element method is applied to three-dimensional analysis of eddy current induced in a large Tokamak device (JT-60). Two techniques to study the eddy current are presented: those of ordinary vector potential and modified vector potential. The latter is originally developed for decreasing dimension of the global matrix. Theoretical treatment of these two is given. The skin effect for alternate current flowing in the circular loop of rectangular cross section is examined as an example of the modified vector potential technique, and the result is compared with analytical one. This technique is useful in analysis of the eddy current problem.

46096 (JAERI-M—7103) **Influence of error fields on the plasma confining field and the plasma confinement in tokamak.** Matsuda, Shinzaburo. (Japan Atomic Energy Research Inst., Tokyo). May 1977. 101p. Dep. NTIS (US Sales Only), PC A06/MF A01.

Influence of error fields on the plasma confining field and the plasma confinement is treated in the standpoint of design. In the initial breakdown phase before formation of the closed magnetic surfaces, the vertical field properly applied is the most important. Once the magnetic surfaces are formed, the non-axisymmetric error field is important. Effect of the shell gap associated with iron core and with pulsed vertical coils is thus studied. The formation of magnetic islands due to the external non-axisymmetric error field is studied with a simple model. A method of suppressing the islands by choosing the minor periodicity is proposed.

46097 (N—77-34016) **Rotational transform angle of the stellarator field with twisted coils.** Ohasa, K.; Miyamoto, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Dec 1976. 15p. (IPPJ—271). NTIS PC A02/MF A01.

The stellarator field produced by the system of twisted coils in the linear configuration is studied analytically. The current of this system can be represented by the superposition of the azimuthal components and the helical components. The rotational transform angle of this system is analyzed. It is found that the fundamental harmonic of the helical components of the current distribution gives the major contribution to the rotational transform angle. The numerical results in the case of the toroidal configuration are compared with the analytical results.

46098 **Theoretical studies of the formation and adiabatic compression of reversed-field configurations in imploding liners.** Book, D.L.; Hammer, D.A.; Turchi, P.J. (Naval Research Lab., Washington, D.C. (USA)). *Nucl. Fusion;* **18**: No. 2, 159-170(1978).

The formation and compression of e-beam-induced reversed-field theta-pinch configurations are studied theoretically in an MHD treatment. Taking into account classical collisional resistivity plus anomalous resistivity derived from microinstabilities, it is shown that plasmas can be created with parameters suitable for liner compression experiments. Adiabatic compression of the quasi-equilibrium plasma/flux mixture is described by using Lagrangian co-ordinates. Results are given for a sample (unoptimized) initial configuration. In the final state, the ratio of plasma to total energy and the total D-T rate are 30% and 20%, respectively, of the values which would be obtained if all the compressional energy went into heating plasma, i.e. assuming negligible magnetic-field-filled volume.

46099 **Evolution of the reversed-field pinch.** Christiansen, J.P.; Roberts, K.V. (UKAEA Research Group, Abingdon. Culham Lab.). *Nucl. Fusion;* **18**: No. 2, 181-197(1978).

This paper discusses the time evolution of a slow Reversed-Field Pinch during the sustainment phase, starting from an initial low-β configuration at the end of the setting-up phase which corresponds approximately to a Taylor Reversed-Field Bessel-function state. Calculations are made with a one-dimensional MHD (1DMHD) equilibrium and diffusion code. Because of local overheating and consequent rise of plasma pressure the central region of low shear becomes Suydam-unstable, and it is assumed that this results in local MHD turbulence, so flattening out the central density and temperature profiles and leading to a quasi-steady state which gradually evolves in time. The pinch then consists of two main zones, a central Suydam-unstable core I and an outer MHD-stable layer II which is responsible for confinement. An external zone III may exist near the wall but is not studied here. The configuration time tausub(c) depends on the time for which the trapped positive Bsub(z) flux psisub(+) can persist against resistive diffusion. This in turn depends on the electron temperature in zone II and hence on the anomalous electron thermal conductivity that is assumed in the model. Some information can be obtained by normalizing the phenomenological transport coefficients used in the code to the measurements made on ZETA but this does not provide a very sensitive check. Further information can be obtained from empirical tokamak scaling laws. Then the performance of the proposed device RFX is predicted. A significant difference between ZETA and RFX is that in ZETA it was the disappearance of the negative flux psisub(-) that terminated the quiescent period, while in RFX it is the positive flux psisub(+) that controls the configuration time. This leads to a substantial improvement in predicted performance.

46100 **Numerical computation of high-beta toroidal diffuse equilibria.** Kondoh, Y. (Department of Electronic Engineering, Gunma Univ., Kiryu, Japan). *Nucl. Fusion;* **18**: No. 3, 422-428(1978).

Letter-to-the-editor.

A method of numerical computation for obtaining diffuse equilibrium configurations of high-beta tori with a free boundary is presented. Typical computation results for various types of the high-beta tokamak, the screw pinch with force-free fields, the reversed-field pinch, the belt pinch, and the double-theta pinch are shown and discussed.

46101 Bifurcated tokamak equilibria related to the shrinking and the disruption of the current. Minardi, E. (UKAEA Research Group, Abingdon. Culham Lab.). *Nucl. Fusion;* **18**: No. 2, 215-228(1978).

A class of neighbouring resistive equilibria for a cylindrical tokamak is constructed, characterized by the invariance of the helical flux chi and of the quantity K=integral A vector B vector dV. The equilibria of this class bifurcate for critical values of the distance of the current channel from the metallic wall, while a cold plasma remains in contact with the wall. The bifurcation only exists for $q<m/n$ in the current channel and for a peaked current, the critical distance from the wall depending solely on the degree of peaking. Any helically deformed equilibrium with a sufficiently peaked and constricted current (so as to reach the bifurcation point) is unstable with respect to a dissipative purely radial compressible mode which conserves approximately K and chi. The building up of the mode implies a decrease of the current, accompanied by a negative axial voltage near the wall. The resistive mode evolves towards a non-linear phase in which the instability exhibits an explosive behaviour. This phase, however, can only be reached if the radial mode is triggered by a helical deformation with sufficiently large amplitude as can be provided by a non-linearly saturated tearing or kink mode.

HEATING AND FUELING SYSTEMS

REFER ALSO TO CITATION(S) 46107

46102 (JAERI-M—7043) **JFT-2 tokamak neutral injector and preliminary results of additional heating experiment.** Sugawara, T.; Akiba, M.; Arakawa, Y.; Fujisawa, N.; Funahashi, A. (Japan Atomic Energy Research Inst., Tokyo). Apr 1977. 27p. Dep. NTIS (US Sales Only), PC A03/MF A01.

A nearly perpendicular injection system of two beam lines for JFT-2 tokamak device is described. Ion heating is obtained up to about 15% rise of target ion temperature using the system. Its heating efficiency is in agreement with the empirical scaling law.

46103 Effect of preacceleration on intense ion-beam transmission efficiency. Whealton, J.H.; Tsai, C.C.; Dagenhart, W.K.; Gardner, W.L.; Haselton, H.H.; Kim, J.; Menon, M.M.; Ryan, P.M.; Schechter, D.E.; Stirling, W.L. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Appl. Phys. Lett.;* **33**: No. 4, 278-279(15 Aug 1978).

Utilization of a preacceleration potential to accelerate ions before they reach the emission aperture results in a substantial increase in the transmission efficiency. For an intense modified duoPIGatron focused multibeamlet (1799 apertures) 22-cm-diam ion source, the total transmission efficiency for beam power through an aperture 20 x 25 cm located 4.10 m downstream increased 30%. This result is in agreement with a previous solution to the appropriate two-dimensional Poisson-Vlasov equation for ions extracted from a plasma.

46104 D-^{3}He as a "clean" fusion reactor. Rand McNally, J. Jr. (Oak Ridge National Lab., Tenn. (USA)). *Nucl. Fusion;* **18**: No. 1, 133-136(1978).

Letter-to-the-editor.

The prospects for relatively "clean" D-^{3}He reactors (lean D, rich ^{3}He) are evaluated with significant gains over a comparable power DT reactor (14-MeV neutrons reduced by 135, all neutrons by 26, plasma tritium by approximately 10^3, tritium handling by approximately 10^3).

46105 Basic requirements of laser fusion power production and laser fusion-fission plutonium breeding. Kidder, R.E. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Reza Kenkyu;* **4**: No. 4, 118-133(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

Required values of thermonuclear energy-gain, inertial confinement, laser-pulse energy and power for both electric power production by laser-fusion and for plutonium breeding by laser fusion-fission are obtained from simple considerations, and are tabulated for purposes of comparison. It is found that breeder requirements are very significantly less demanding, suggesting that plutonium breeding is a much more feasible near-term goal of laser fusion.

POWER CONVERSION SYSTEMS

46106 Use of a Hall accelerator in the production of negative hydrogen ions in cesium vapor. Kamperschroer, J.H.; Post, R.S. (Nuclear Engineering Department, University of Wisconsin, Madison, Wisconsin 53706). *J. Appl. Phys.;* **49**: No. 6, 3059-3065(Jun 1978).

Atomic hydrogen particles from a Hall accelerator were utilized in low-energy (<2 keV) negative-hydrogen-ion-production experiments in cesium vapor. Cell thicknesses in the range 8 x 10^{11} to 6 x 10^{15} Cs atoms/cm^2 were studied for H^- current densities on the order of 1 mA/cm^2. Anomalously, large H^- fractions of up to 30—60% were observed at intermediate cell thicknesses when protons were not removed from the dominantly H^0 incident beam. These observations indicate either the presence of excitation of the H^0 beam or the existence of two space-charge phenomena: a focusing effect inside of the cesium cell, due to a buildup of positive space charge in the beam line, and a divergence effect as the H^- beam emerges from the cesium cell due to a lack of space-charge neutralization.

INERTIAL CONFINEMENT TECHNOLOGY

REFER ALSO TO CITATION(S) 45162, 45163, 45164, 45165, 45166, 45212, 45213, 45214, 45215

46107 (N—77-33981) **New lens system using toroidal magnetic field for intense ion beams.** Mohri, A.; Ikuta, K.; Fujita, J. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Nov 1976. 25p. (IPPJ—264). NTIS PC A02/MF A01.

The use of toroidal magnetic field as a lens system is proposed for producing intense ion beam. The characteristics of the lens system are obtained both analytically and numerically. Some examples of ray-trajectories are presented for different focal lengths. The system is applicable to neutral beam injection heating and micro-pellet implosion for nuclear fusion, and to the other fields such as ion beam X-ray lasers.

46108 Transport studies of cusp and multichannel REB fusion concepts. Wright, T.P. (Theoretical Division—5231, Sandia Laboratories, Albuquerque, New Mexico 87115). *J. Appl. Phys.;* **49**: No. 7, 3842-3850(Jul 1978).

Single-particle trajectory calculations have been used to study the effectiveness of beam concentration near a target pellet in two relativistic electron-beam-driven inertial fusion concepts: magnetic cusps and multiple current-carrying channels in a wagon-wheel configuration. Angular momentum constraints favor the multichannel transport scheme. The role of angular momentum nonconserving reflections from plugged-cusp loss cones is discussed. Minimum radii are calculated for various injection conditions in a 40-channel configuration. The resulting superposition of beams may provide an order-of-magnitude improvement in beam concentration over single-beam results.

46109 Repetitive output laser system and method using target reflectivity. Johnson, R.R. (to KMS Fusion, Inc.). US Patent 4,084,908. 18 Apr 1978. Filed date 10 Nov 1975. 8p.

An improved laser system and method for implosion of a thermonuclear fuel pellet is described in which that portion of a laser pulse reflected by the target pellet is utilized in the laser system to initiate a succeeding target implosion, and in which the energy stored in the laser system to amplify the initial laser pulse, but not completely absorbed thereby, is used to amplify succeeding laser pulses initiated by target reflylection.

46110 Reply by K.A. Brueckner on comments by E. Panarella on the paper 'Wavelength dependence of laser coupling to pellet implosions' by K.A. Brueckner and R.S. Janda, Nucl. Fusion 17(2) (1977) 305. Brueckner, K.A. *Nucl. Fusion;* **18**: No. 3, 436(1978).

Short communication only.

46111 Comments on the paper by K.A. Brueckner and R.S. Janda 'Wavelength dependence of laser coupling to pellet implosions' Nucl. Fusion 17(2) (1977) 305. Panarella, E. (National Research Council of Canada, Ottawa, Ontario). *Nucl. Fusion;* **18**: No. 3, 435(1978).

Short communication only.

46112 Thick-shell shock-focusing electron beam targets. Sweeney, M.A.; Widner, M.M. (Sandia Labs., Albuquerque, N.Mex. (USA)). *Nucl. Fusion;* **18**: No. 3, 429-433(1978).

Letter-to-the-editor.

Calculations for a new electron-beam target design, which employs a very thick shell for shock focusing and attenuation of the deposition tail, are presented. Low-temperature material properties of the pusher (melting, vaporization) are crucial to target behaviour. Because of the cold inner pusher surface, standard shock-wave measurements can be used to study implosion dynamics, beam-target coupling, and materials response of ablatively-driven targets at high pressures (10 megabars) and high velocities (3cmμ^{-1}) on current accelerators. The targets should be useful in early neutron production studies with ablative drivers; 10^6 neutrons are expected for

0.1TW of 1-MeV electrons absorbed. Fuel-pusher instability is not a problem, but irradiation uniformity of 1-2%, characteristic of all ablatively-driven designs at these powers, is required.

46113 Simplified theoretical model of laser-produced spherical plasma. Ohwadano, Y.; Sekiguchi, T. (Tokyo Univ. (Japan). Faculty of Engineering). *Jpn. J. Appl. Phys.;* **16**: No. 6, 1025-1032(Jun 1977).

A simplified theoretical model for laser-produced spherical plasma during the laser heating period is proposed mainly from the application viewpoints. Attentions are paid to the time variation of the cut-off density surface, the plasma temperature and the transparency time for laser light, and these quantities are obtained in analytical forms for given parameters. The analytical results are compared with those obtained from numerical analyses based upon a spherically symmetric, one-dimensional Lagrangian hydrodynamic code (one-fluid, two-temperature). These two are found to be in good agreement, irrespective of the rather crude assumptions made in the analytical treatments. Thus, our simple theoretical model appears to serve to explain the approximate gross properties of laser-produced plasma during the laser heating phase.

46114 Laser fusion experiments at 2 TW. Ahlstrom, H.G. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Reza Kenkyu;* **4**: No. 4, 1-16(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

The Lawrence Livermore Laboratory solid state laser system, ARGUS, has successfully performed laser implosion experiments at power levels exceeding 2 TW. D-T filled glass microspheres have been imploded to yield thermonuclear reaction products in excess of 10^8 per event. Neutron and α time of flight measurements indicate that D-T ion temperatures of (3-4.5 keV) and a density confinement time product (n tau) of -- (1-3) x 10^{12} were obtained in these experiments. Typically two 30J, 30 psec pulses of 1.06 μm light were focused on targets using 20 cm aperture f/l lenses, producing intensities at the target in excess of 10^{16} W/cm^2. An extensive array of diagnostics routinely monitored the laser performance and the laser target interaction process. Measurements of absorption and asymmetry in both the scattered light distribution and the ion blow off is evidence for non-classical resonant processes absorption mechanisms and density scale heights of the order of 2 μm or less. The symmetry of the thermonuclear burn region is investigated by monitoring the α particle flux in several directions, and an experiment to image the thermonuclear burn region is in process. These experiments significantly extend our data base and our understanding of laser induced thermonuclear implosions and the basic laser plasma interaction physics from the 0.4 to 0.7 TW level of previous experiments.

46115 Laser plasma interactions at 10.6 μm wavelengths. Boyer, K. (Los Alamos Scientific Lab., N.Mex. (USA)). *Reza Kenkyu;* **4**: No. 4, 108-117(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

The scaling of electron and ion energy spectra with wavelength in laser plasma and the related experimental work are introduced. There are three models giving different scaling laws. The first model is based on the parametric instability in homogeneous plasma, the second model on the flux limiting argument which equates the power absorbed with the heat flow away from the absorption region. The third model assumes a stochastically thin heating region. Experiments have been conducted by McCall and co-workers for laser intensity from 10^{14} to 10^{15} watts/cm^2 at both 1.06 μm and 10.6 μm. Measurements were made about the X-ray spectra, electron spectra, ion spectra, and the relative numbers of electrons and fast ions leaving the two faces of this foils as functions of foil thickness. In general, the electron and ion energy distributions are found to be very weakly dependent on laser wavelength and intensity in the region of interest. However, the fluxes are several times higher at 10.6 μm than at 1.06 μm. The front to back face ratio of fast ion emission as a function of foil thickness showed that it originated from each foil face due to space charge effect. The data might be understood in terms of the strong profile modification due to the radiation pressure giving rise to an electromagnetic skin effect. Pin hole photographs of massive flat targets were taken with both CO_2 and Nd lasers, and showed that the lateral heat flow in 1 ns was small.

46116 Laser driven compression and neutron generation with spherical shell targets. Campbell, P.M.; Hammerling, P.; Johnson, R.R.; Kubis, J.J.; Mayer, F.J. (KMS Fusion, Inc., Ann Arbor, Mich. (USA)). *Reza Kenkyu;* **4**: No. 4, 134-152(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

Laser-driven implosion experiments using DT-gas-filled spherical glass-shell targets are described. Neutron yields to 5 x 10^7 are produced from implosions of small (-- 55 μm-diameter) targets spherically illuminated with an on-target laser power of 0.4 terawatt. Nuclear reaction product diagnostics, X-ray pinhole photographs, fast-ion spectra and X-ray measurements are used in conjunction with hydrodynamic computer code simulations to investigate the implosion phenomenology as well as the target corona evolution. Simulations using completely classical effects are not able to describe the full range of experimental data. Electron or radiation preheating may be required to explain some implosion measurements.

46117 Elementary analysis of fusion implosions. Osborn, R.K. (Michigan Univ., Ann Arbor (USA). Dept. of Nuclear Engineering); Mayer, F.J. *Reza Kenkyu;* **4**: No. 4, 60-70(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

The elementary, self-similar solutions of single fluid hydrodynamics have been frequently employed to study diverse aspects of fusion implosions. We have used them for the explicit purpose of attempting empirical correlations among various parameters measured in the laser-fusion experiments conducted by KMSF. Some of the measurable parameters correlated by these model calculations are: D-T neutron yields; spectra and total energy radiated as X-rays; compression; initial target radii; thermal energy at peak compression; etc. In spite of the over-simplified nature of the physical model, the correlations are surprisingly good. A two fluid version of the same model - the electron and ion fluids coupled by electrostatic forces - was also investigated perturbation-wise relative to the uncoupled solutions. It was found that substantial, relative to thermal, energy could be stored as plasma oscillations.

46118 Exploding pusher experiments utilizing a 4π illumination system. Storm, E.K.; Ahlstrom, H.G.; Monjes, J.A.; Swain, J.E.; Rupert, V.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Reza Kenkyu;* **4**: No. 4, 17-31(Mar 1977).

From U.S.-Japan seminar on laser interaction with matter; New York, USA (1 - 5 Nov 1976).

A focusing system which utilizes two f/0.47 doublets in conjunction with ellipsoidal mirrors produces two focusing cones with half angles of 81.5^0. This system has been used with the LLL Janus laser system to irradiate and implode DT filled glass microshells -- 80 μm diameter. The purpose of the system was to provide more uniform heating of the pusher and compression of the fuel than had been obtained with Janus irradiated targets using f/l lenses. Neutron yields of -- 10^7 per event have been obtained and x-ray micrographs indicate that the heating of the pusher was more uniform. Also the implosions are definitely more spherical than those obtained with the f/l lenses. Data is also presented which add further confirmation to the importance of absorption by plasma wave resonance for non normal incidence of the laser light with the target.

46119 Laser interaction and related plasma phenomena. Volume 4a. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977). 1161p. (CONF-761155—P1). $10.00.

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

This book reports and analyzes the latest theoretical and experimental research findings in the areas of lasers for fusion, x-ray and gamma-ray lasers, targets for laser fusion, moderate intensities in plasmas, and fusion-oriented experiments with lasers and plasmas. Separate abstracts are presented for each included paper. (MOW)

46120 Laser damage phenomenology in materials. Armistead, R.A.; Magee, T.J. (Stanford Research Inst., Menlo Park, CA). pp 67-90 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

This paper presents the results of a series of investigations on the influence of microscopic defects on the infrared optical properties of selected semiconductor high-power laser window materials and the effects of ionizing radiation on the visible-UV and infrared absorption of alkali halide and semiconductor laser windows.

46121 CO_2 laser systems for fusion experiments. Singer, S. (Los Alamos Scientific Lab., NM). pp 121-142 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

The development of large power amplifiers needed to generate these intense optical beams has absorbed much effort in the fusion programs; yet, there is more to developing a satisfactory laser fusion system than merely obtaining a power amplifier. Some of the requirements demanded of the fusion system are the following: proper temporal pulse shape, satisfactory freedom from wave front error, efficient energy extraction, adequate energy on target, freedom from parasitic or system oscillation, satisfactory absence of prepulse energy, protection against retropulse-produced damage,

proper pointing and focusing of on-target beams, and absence of optically-induced damage to components. At 10.6 μm, the difficulty of obtaining optical sensors and saturable absorbers renders these system properties more difficult to achieve. In this paper, the methods by which some of these problems are overcome are described.

46122 High-temperature high-quality deuterium plasma production by laser beams and interactions with magnetic fields. Sato, K.N. (Nagoya Univ., Japan); Okada, S.; Kogoshi, S.; Sudo, S.; Tsuji, H.; Ohwadano, Y.; Sekiguchi, T. pp 333-351 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

A new system for directly producing high-temperature high-quality deuterium plasmas within any type of magnetic containers has been constructed and operated, in which an on-line computer control technique is utilized to capture a falling deuterium ice-pellet by pulsed laser beam(s). Some experimental results on the fundamental physical properties of plasmas produced and interactions with nearly uniform magnetic field are presented. As an immediate application of this particular new plasma production method, detailed studies of spindle-cusp confinement properties for laser-produced high-beta deuterium plasma are being continued. Some of the computer analyses for these problems are also reviewed.

46123 Fusion laser development at the Lawrence Livermore Laboratory. Trenholme, J.; Bliss, E.; Emmett, J. (Lawrence Livermore Lab., CA). pp 1-13 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

In the pursuit of laser fusion, the Lawrence Livermore Laboratory (LLL) has undertaken a broad program of glass laser development and construction. This paper reviews the history of this effort, and indicates its future thrust. The CYCLOPS, JANUS, ARGUS, and SHIVA lasers are described, and possible larger lasers are discussed.

46124 Powerful 12-channel laser installation "DELFIN" for spherical heating of thermonuclear targets. Basov, N.G.; Krokhin, O.N.; Mikhailov, Yu.A.; Sklizkov, G.V.; Fedotov, S.I. (Lebedev Physical Inst., Moscow). pp 15-42 of Laser interaction and related plasma phenomena. Volume 4A. Schwarz, H.J.; Hora, H. (eds.). New York; Plenum Publishing Corp. (1977).

From 4. workshop on laser interaction and related plasma phenomena; Troy, NY, USA (8 Nov 1976).

See CONF-761155—P1.

A 12-beam powerful laser installation "DELFIN" for high-temperature spherical heating of thermonuclear targets is described. The installation consists of a Nd-laser (ultimate energy about 10 kJ, pulse duration 1 ns and 0.1 ns, and divergence of 5×10^{-4} rad), target chamber for laser plasma interaction research, and a set of diagnostic systems to study laser and plasma parameters. The optical scheme and constructive peculiarities of the laser system are under consideration. Analysis of the focusing scheme is performed and a description of the focusing system of "DELFIN," which makes it possible to obtain a high degree symmetry of spherical illumination of the target, is given. Expected flux density at the target is 10^{15} W/cm^2, while the laser power is about 10 TW. The theoretical analysis of ultimate possibilities of concentration of the multi-beam laser radiation in the spherical target has been performed, when the really attainable radiation parameters have been taken into account. For a given target structure the ultimate energy, which can be focused in the target, seems to occur. The theoretical estimation has resulted in a successive-parallel scheme of the powerful laser, which is optimal. This scheme has been used in "DELFIN."

COMPONENT DEVELOPMENT AND MATERIALS TESTING

REFER ALSO TO CITATION(S) 46094

46125 (JAERI-M—7130) **Simulation of drive characteristics of JT-60 movable limiter.** Takashima, T.; Okamura, H. (Japan Atomic Energy Research Inst., Tokyo). Jun 1977. 23p. (In Japanese). Dep. NTIS (US Sales Only), PC A03/MF A01.

A drive mechanism of the fast movable limiter for JT-60 uses an oil-pressure hydraulic system, which is controlled by servovalves. The signal which operates servovalves is generated by a mixing-amplifier amplifying the difference between a signal from the potentiometer and a input signal. However causes which decide the actual drive characteristics are so numerous that it is very difficult to guess the actual drive patterns from a certain input signal. We introduced some equations at each parts of the drive mechanism and simulated the drive characteristics. The time dependences of the stroke, the velocity and the acceleration obtained by the simulation are in good agreement with the experimental results.

46126 (JAERI-M—7198) **Repair/maintenance design for tokamak fusion power reactor.** (Japan Atomic Energy Research Inst., Tokyo). Aug 1977. 67p. (In Japanese). Dep. NTIS (US Sales Only), PC A04/MF A01.

Disassembling and reassembling a tokamak fusion power reactor for repair and maintenance have been studied. The reactor is divided into twelve modules so only damaged modules can be removed from the reactor room and transferred to a repair shop. Repair process and method, facilities and their sizes were examined. Repair method and dismounting equipments, transport system of the modules, repair facilities for blanket etc. were designed. Though with some problems for future study, the methods seem to be successful.

46127 (UCRL—13801) **Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors.** Hopkins, G.R.; Price, R.J.; Bullock, R.A.; Dalessandro, J.A.; Hovingh, J. (General Atomic Co., San Diego, Calif. (USA); California Univ., Livermore (USA). Lawrence Livermore Lab.). 1977. Contract W-7405-ENG-48. 10p. Dep. NTIS, PC A02/MF A01.

Portions of document are illegible.

Self-consistent sets of materials-property data are developed for H-451 graphite, POCO carbon, pyrocarbon, and chemical-vapor-deposited silicon carbide. An inertial-confinement fusion reactor fuel-pellet output which produces primarily a surface heat flux on the first wall, typical of a debris pulsed heat load, is then defined for calculation of the thermal and stress response of first walls constructed from the above materials. Vaporization rates determined by maximum surface temperature and compressive stresses on the surface from temperature changes are calculated and may be used to determine cavity wall radii for a variety of pellet output-wall lifetime limits.

46128 Mirror-damage thresholds for laser-fusion pulse shapes. Howard, J.E.; Hunter, T.O. (University of Wisconsin, Madison, Wisconsin 53706). *J. Appl. Phys.;* **49**: No. 7, 3747-3749(Jul 1978).

Mirror-surface-damage thresholds are calculated analytically for two temporal pulse forms relevant to laser-fusion experiments; a truncated Gaussian and the "ideal" isentropic pulse. The results show that 20% more laser energy/cm^2 may be handled using a two e-folding Gaussian of the same FWHM as a square pulse of equal peak power. The surface-temperature rise is given in completely closed form for the isentropic pulse and applied to a conceptual laser-fusion design.

46129 Simple manipulator for rotating spheres. Weinstein, B.W.; Hendricks, C.D.; Ward, C.M.; Willenborg, D.L. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). *Rev. Sci. Instrum.;* **49**: No. 6, 870-871(Jun 1978).

We describe a simple device for rapidly rotating a small sphere to any orientation for inspection of the surface. The ball is held between two small, flat surfaces and rolls as the surfaces are moved differentially parallel to one another.

46130 TFTR vacuum system. Abel, B.D. (Grumman Aerospace Corporation, Bethpage, New York 11714). *J. Vac. Sci. Technol.;* **15**: No. 2, 726-733(Mar 1978).

The Tokamak Fusion Test Reactor (TFTR) will be the first magnetic plasma device in the United States capable of producing energy in any significant quantity by the fusion of deuterium and tritium nuclei. The function of the vacuum pumping system is to provide the high-vacuum environment for plasma initiation, to remove spent plasma constituents at the conclusion of each plasma pulse, and to provide initial high vacuum and regeneration of the neutral beam cryopanels. Radiation produced by the fusion reaction and the requirement to pump tritium have presented significant design problems not ordinarily encountered in the design of ultra-high vacuum systems. The configuration and piping schematic of the preliminary design vacuum pumping system capable of fulfilling the requirements is discussed. The selection process for the high-vacuum pumps is reviewed and the rationale for the use of turbomolecular pumps, based on projected overall vacuum pumping system reliability, is presented. A computer was used to predict vacuum system performance. Preliminary computer-generated pumpdown curves are presented for plasma pulsing operations and pumpdowns from atmospheric pressure.

46131 Cryosorption pumping of deuterium by MS-5A at temperatures above 4.2 K for fusion reactor applications. Fisher, P.W.; Watson, J.S. (Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Vac. Sci. Technol.;* **15**: No. 2, 741-744(Mar 1978).

An excalibur CVR-1106 cryosorption pump was fitted with a special cooling system to permit measurement of deuterium pumping speeds at temperatures between 6 and 20 K. Pumping speeds were found to be a function of feed rate, loading prior to each run, loading during runs, and thermal treatment between runs. At feed rates $< 3 \times 10^{-4}$ Torr l s^{-1} cm^{-2}, speeds were near 1 l s^{-1} cm^{-2} initially and

declined monotonically with loading. At high feed rates, speeds reached a higher maximum (~3 l s^{-1} cm^{-2}) but also generally declined with loading; however, after 50—100 Torr l had accumulated, the pump underwent a spontaneous transition which effected a return to the original (high) pumping speed. This transition was accompanied by pressure spikes in the test chamber and temperature spikes in the sieve panel. Initial speeds for each consecutive run equaled the final speed for the preceding run if the pump was maintained at operating temperature; however, if it was warmed to 77 K and recooled, a restoration to the maximum speed was observed at the beginning of the next run.

46132 Re-circulating power, unit costs and thermal pollution of fusion power stations. Davenport, P.A. (UKAEA Research Group, Abingdon. Culham Lab.). *Nucl. Fusion;* **18**: No. 3, 420-422(1978).

Letter-to-the-editor.

The fraction epsilon of electrical power re-circulated is shown to be of crucial importance in assessing the credibility of fusion systems as commercial reactors, and it is advocated that epsilon should replace the more commonly used criterion Q, the energy amplification in the fusion reactor itself. Both unit costs and thermal pollution are shown to scale as (constant+epsilon)/(1-epsilon) and the dire consequences of high epsilon-values are quantitatively demonstrated.

46133 Application of torsion vacuum microbalance to sputtering yield measurement. Akaishi, K.; Miyahara, A. (Nagoya Univ. (Japan). Inst. of Plasma Physics); Sukenobu, S.; Komizo, M. *Shinku;* **20**: No. 5, 161-169(May 1977). (In Japanese).

The torsion vacuum microbalance technique useful for the determination of the sputtering yield of wall materials for fusion reactors was developed. In order to measure the rate of weight change of the samples during sputtering continuously, it is very important to keep the null point drift of the microbalance as small as possible. The deflection angle of the balance beam was detected and amplified by optical lever, and was transformed to electrical output by linear photopotentiometer. The null point drift wave mainly caused by temperature change in the laboratory, which induced relative displacement by thermal expansion between the balance system and the optical measuring system. The drift was reduced less than the equivalent weight of 4 x 10^{-7} g/hr when the balance system wosset in the thermostat kept at 20 +- 0.5°C. The sensitivity of the balance was 8.3 x 10^{-7} g/mV. The microbalance technique developed was applied to the measurement of sputtering yield of Cu by Ar^+. The measurement was carried out with Ar^+ ion energy of 0.2 -- 2 keV, beam current of 0.5 -- 1.5 μA, and sputtering time of 2 hrs. The initial weight of Cu sample was 0.4g (15 mm x 15 mm sheet) and the sample temperature during sputtering was about 120°C. The sputtering yields obtained show good agreement with the results reported by Wehner et al.

GENERAL AND MISCELLANEOUS

MATHEMATICS AND COMPUTERS

REFER ALSO TO CITATION(S) 44310

46134 (BNL—24181) **Conditions for product form network solution through the analysis of finite queues with overflows.** Noetzel, A.S. (Brookhaven National Lab., Upton, N.Y. (USA)). 1978. Contract EY-76-C-02-0016. 5p. (CONF-780328—2). Dep. NTIS, PC A02/MF A01.

From Conference on information sciences and systems; Baltimore, MD, USA (29 Mar 1978).

Portions of document are illegible.

The problem of characterizing the class of queues for which queuing networks have product form equilibrium state probabilities is approached by representing a finite-capacity queue as a finite-state, continuous-parameter Markov process. The conditional queuing process, given that no departures take place in an interval, is shown to be a stationary process whenever the queue has the local balance property. The Poisson departure process is then an immediate consequence of local balance. A generalized form of local balance, also yielding Poisson departures, is shown. A queue that has Poisson departures but not general local balance is demonstrated, and is shown to yield the product form in one simple network. The conjecture that the Poisson departure characteristic is sufficient for the product form network solution results from this. 4 figures.

46135 (CONF-7706110—) **Energy-related environmental computer graphics systems in the Department of Energy Laboratories.** (Department of Energy, Washington, D.C. (USA). Div. of Environmental Impact). Feb 1978. 147p. Dep. NTIS, MF A01.

From Energy related environmental computer and graphics systems conference; Germantown, MD, USA (6 Jun 1977).

Portions of document are illegible.

Computerized graphics techniques available in the Department of Energy's national laboratories for use in the environmental aspects of energy such as land use planning (including siting), and regional studies, environmental impact assessment are discussed. Areas covered include: computer graphics; mapping/cartography; image processing; animation; computer movies; satellite graphics; surface representation; land use analysis; pattern recognition; demographics analysis; ecological analysis; and biomedical applications. Descriptions of each graphics system included should be sufficient for a potential user to determine its possible use to him. Further, information is available by writing or telephoning the indicated contact person.

46136 (COO—3077-148) **Configurable software for satellite graphics.** Hartzman, P.D. (New York Univ., N.Y. (USA). Courant Mathematics and Computing Lab.). Dec 1977. Contract EY-76-C-02-3077. 176p. Dep. NTIS, PC A09/MF A01.

An important goal in interactive computer graphics is to provide users with both quick system responses for basic graphics functions and enough computing power for complex calculations. One solution is to have a distributed graphics system in which a minicomputer and a powerful large computer share the work. The most versatile type of distributed system is an intelligent satellite system in which the minicomputer is programmable by the application user and can do most of the work while the large remote machine is used for difficult computations. At New York University, the hardware was configured from available equipment. The level of system intelligence resulted almost completely from software development. Unlike previous work with intelligent satellites, the resulting system had system control centered in the satellite. It also had the ability to reconfigure software during realtime operation. The design of the system was done at a very high level using set theoretic language. The specification clearly illustrated processor boundaries and interfaces. The high-level specification also produced a compact, machine-independent virtual graphics data structure for picture representation. The software was written in a systems implementation language; thus, only one set of programs was needed for both machines. A user can program both machines in a single language. Tests of the system with an application program indicate that is has very high potential. A major result of this work is the demonstration that a gigantic investment in new hardware is not necessary for computing facilities interested in graphics.

46137 (DOE/EV—0006) **Recommendations for CAMAC Serial Highway drivers and LAM Graders for the SCC-L2 Serial Crate Controller.** (Department of Energy, Washington, D.C. (USA). Div. of Biomedical and Environmental Research). Jan 1978. 64p. Dep. NTIS, PC A04/MF A01.

The functional requirements of Drivers for the CAMAC Serial Highway defined in IEEE Standard 595-1976 are described. The description is independent of the implementation, and in particular no assumption is made about the boundary between hardware and software within the Driver. Topics covered are the user interface, the supporting system services required, demand handling, and a detailed discussion of the message analysis for various levels of error recovery. An appendix describes the recommended features of LAM Graders for use with the Serial Crate Controller Type L2 of IEEE Std 595-1976.

46138 (LBL—7256) **Nine-fold way: a tutorial in successful performance management.** Stevens, D.F. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jan 1978. Contract W-7405-ENG-48. 13p. (CONF-780607—1). Dep. NTIS, PC A02/MF A01.

From Conference on the performance of computer installations; Gardone, Riviera, Italy (22 Jun 1978).

Nine principles of computer installation performance management are formulated and discussed, with examples from current practice.

46139 (SAND—78-0493) **Codes for Dijkstra's shortest path algorithm.** Hulme, B.L.; Wisniewski, J.A. (Sandia Labs., Albuquerque, N.Mex. (USA)). Apr 1978. Contract EY-76-C-04-0789. 35p. Dep. NTIS, PC A03/MF A01.

This report is a users guide to three subroutines for finding shortest paths in a graph. The three codes, DKSTR, SDKSTR, and USDKST, all implement Dijkstra's method as modified by Yen. They differ in their data structures, since DKSTR is intended for general use, while SDKSTR is intended for sparse graphs and USDKST is tailored to undirected sparse graphs. Because of its speed and its potential for great storage savings in applied problems where the graphs tend to be large and sparse, SDKSTR is seen to be the most useful of these codes.

46140 (SAND—78-0909) **Storage reduction for Runge-Kutta codes.** Shampine, L.F. (Sandia Labs., Albuquerque, N.Mex. (USA)).

May 1978. Contract EY-76-C-04-0789. 12p. Dep. NTIS, PC A02/MF A01.

Three techniques of increasing generality for reducing storage requirements of Runge—Kutta codes are described. Although the first two require the formula to have special properties, they are broadly applicable and may substantially reduce the storage without any extra operations and without any real complication of the code. The last technique is new and completely general. It affords a substantial reduction in storage if the number of stages is moderate to large. There are no extra arithmetic operations, but there is a small penalty in overhead because of some swapping in memory. The techniques may be combined. A few illustrative examples of practical importance are given. (RWR)

46141 (UCID—3994) **Computer performance management at LBL.** Stevens, D.F. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Apr 1978. Contract W-7405-ENG-48. 38p. Dep. NTIS, PC A03/MF A01.

Portions of document are illegible.

The approach of LBL to five aspects of computer performance management--workload projection, system tuning, behavior modification, information gathering, and service levels--is outlined. Two factors exert considerable influence on the operation of the LBL computer center: the center writes its own operating system when necessary, and the style of computing is entirely open shop. 28 figures. (RWR)

46142 (UCID—17749) **Data Director system manual.** McGoldrick, P.R.; Butner, D.N. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 16 Mar 1978. Contract W-7405-ENG-48. 155p. Dep. NTIS, PC A08/MF A01.

Portions of document are illegible.

The Data Director is a multi-user timesharing computer system which allows file manipulation (i.e., editing, printing, punching, etc.) and file transport between it and the OCTOPUS computer system. The heart of the Data Director is an Interdata 7/16 HSALU mini-computer with a 10-Megabyte disk. Data Director users use 9600-baud CRT terminals to interact with the Data Director. The main purposes of the Data Director are to provide a fast, stable, and reliable system for editing and to provide remote punching of files.

46143 **Block implicit one-step methods.** Watanabe, D.S. *Math. Comput.;* **32**: No. 1142, 405-414(Apr 1978).

A new class of block implicit one-step methods for ordinary differential equations is presented. The methods are based on quadrature and generate function values at nonmesh points through Hermite interpolation. A general convergence theorem for block implicit methods is given, and the stability of the new class of methods is analyzed. The class contains A-stable, stiffly stable, strongly A-stable, and strongly stiffly stable methods. Numerical results demonstrating the efficiency and effectiveness of a particular block method are presented.

46144 **Fast Poisson solvers for problems with sparsity.** Banegas, A. *Math. Comput.;* **32**: No. 1142, 441-446(Apr 1978).

Fast Poisson solvers, which provide the numerical solution of Poisson's equation on regions that permit the separation of variables, have proven very useful in many applications. In certain of these applications the data is sparse and the solution is only required at relatively few mesh points. For such problems this paper develops algorithms that allow considerable savings in computer storage as well as execution speed. Results of numerical experiments are given.

46145 **Roots of two transcendental equations as functions of a continuous real parameter.** Pexton, R.L.; Steiger, A.D. *Math. Comput.;* **32**: No. 1142, 511-518(Apr 1978).

The roots, λ and eta, of the transcendental equation j/sub l/(αλ) y/sub l/(λ) = j/sub l/(λ) y/sub l/(αλ) and [xj/sub l/(x)]'/sub x/=αeta[xy/sub l/(x)]' /sub x/=eta=xj/sub l/(x)]'/sub x/=eta[xy/sub l/ (x)]'/sub x/=αeta, where l=1, 2,... are considered as functions of the continuous real parameter α. The symbols j/sub l/ and y/sub l/ denote the spherical Bessel functions of the first and second kind. The two transcendental equations are invariant under the transformations λ→-λ and eta→-eta, respectively. Therefore, only positive roots are discussed. All the λ-roots increase monotonically as α increases in the open interval (0,1). For each order l, th smallest eta-root decreases monotonically as α increases in (0,1), tending towards $\sqrt{l(l+1)}$ as α approaches unity. For α ∈ (0,1), all the other eta-roots have a minimum value equal to $\sqrt{l(l+1)}/\alpha$.

46146 **Reduction of the direct product of irreducible representations of the supersymmetry group in the rest frame.** Tseitlin, V.Y. (Dnepropetrovsk State University). *Sov. J. Nucl. Phys. (Engl. Transl.);* **25**: No. 6, 666-670(Jun 1977).

The structure of the irreducible representations of a supersymmetry is studied and an angular momentum basis, convenient for physical applications, is constructed. The coefficients for the reduction of a direct product of supersymmetries into irreducible representations are found in the rest frame. The quark model is discussed in the framework of a supersymmetric theory.

INFORMATION HANDLING

REFER ALSO TO CITATION(S) 44866

46147 **Structure and method of operation of the section 'bibliography, documentation' and its importance for the research work of the Tremonia experimental mine.** Hess, G. (Versuchsgrubengesellschaft m.b.H., Dortmund (Germany, F.R.)). *Bergbau;* **28**: No. 8, 299-302(Aug 1977). (In German).

The experimental mine company Ltd in Dortmund, FRG, has created a section concerned with bibliography and documentation, aiming at the collection and evaluation of research and development results gained at home and abroad, as well as other relevant information related to the work planned or carried out on the Tremonia experimental mine. Information - particularly on safety problems in the mining industry - are being made available not only to their own scientists, but also to other institutions and to individuals.

CORPORATE INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (TID-4585) is used in the standardization of corporate entries. TID-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

A

Abcor, Inc., Wilmington, Mass. (USA). Walden Div.
Research on cross-flow filtration for solids removal from coal syncrudes. Final report, 3:44061 (FE—2245-16)

Abcor, Inc., Wilmington, Mass. (USA). Walden Research Div.
Development of the 1975 area source inventory for the state of Illinois. Final report, 3:44878 (PB—274685)

Aerodyne Research, Inc., Bedford, Mass. (USA)
Measurements of nitric oxide ion vibrational absorption coefficient and vibrational transfer to N_2, 3:45481 (AD-A—048628)

Aerospace Corp., El Segundo, Calif. (USA). Ivan A. Getting Labs.
Boundary layer effects in chemical laser nozzle inlet. Interim report, 3:45157 (AD-A—048447)
Energetic electrons at the synchronous altitude 1974—1977. Interim report, 3:45485 (AD-A—048432)
New numerical methods applied to solving the one-dimensional eigenvalue problem. Interim report, 3:45852 (AD-A—048446)

AiResearch Mfg. Co., Los Angeles, Calif. (USA)
Study of heat engine/flywheel: hybrid propulsion configuration with electrical transmission system, Phase II, final report. Design definition, 3:44971 (ALO—41/2)

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio (USA). School of Engineering
Effects of gamma radiation on gallium-arsenide lasers. Master's thesis, 3:45156 (AD-A—048361)

Air Force Weapons Lab., Kirtland AFB, N.Mex. (USA)
Development of an artificial viscosity function. Final report, 3:45283 (AD-A—048778)
Safety methodology for space nuclear systems. Final report, 3:44324 (AD-A—048780)

Allied Chemical Corp., Idaho Falls, Idaho (USA). Idaho Chemical Programs - Operations Office
Pilot-plant development of a Rover waste calcination flowsheet, 3:44280 (ICP—1148)
Remote maintenance development, July 1, 1976—June 30, 1977, 3:45148 (ICP—1143)

Allied-General Nuclear Services, Barnwell, S.C. (USA)
Current status and future considerations for a transportation system for spent fuel and radioactive waste, 3:44275 (Y/OWI/SUB—77/42513)

Aluminum Co. of America, Alcoa Center, Pa. Alcoa Labs.
Production of aluminum-silicon alloy and ferrosilicon and commercial purity aluminum by the direct reduction process. First quarterly progress report, 1 September 1977—30 November 1977, 3:45003 (TID—28260)

American Museum of Natural History, New York. Dept. of Mineral Sciences
Silicate petrography and origin of the mesosiderites: a preliminary investigation of their relationships to the howardite-eurite-diogenite suite, 3:45434 (CONF-780314—2)

American Society of Civil Engineers, New York
Econocrete. Preprint 2845, 3:44956 (CONF-770448—3)
Use of the dryer drum. Preprint 2843, 3:44957 (CONF-770448—2)

Ames Lab., Iowa (USA)
Critical currents of a one-dimensional array of superconducting vortices in a periodic pinning potential, 3:45845 (IS-M—137)
Multilaboratory analytical quality control for the hydrochemical and stream sediment reconnaissance, 3:44213 (IS—4370)
Specifications for an inductively coupled plasma simultaneous multielement analysis system, 3:45112 (IS—4353)

AN SSSR, Leningrad. Inst. Yadernoj Fiziki
Dynamics of collision of fast nuclei ($E \sim 200$ MeV/nucleon), shock waves, and the compression of nuclear material, 3:45808 (ORNL-tr—4653)

Argonne National Lab., Ill. (USA)
Advanced processes for generation of electric power: solvent refining of coal and combined cycle plants, 3:44072 (CONF-7710101—11)
Assessment of the health and environmental effects of power generation in the Midwest. Volume II. Ecological effects, 3:44088 (ANL/AA—6(Vol.2)(DRAFT))
Comparative safety physics parameters in the advanced fuels critical assemblies, 3:44786 (ZPR-TM—312)
Comparisons of sodium void and Doppler reactivities in large oxide and carbide LMFBRs, 3:44687 (ANL—78-41)
Computation of the weight function from a stress intensity factor, 3:44686 (ANL—77-82)
Electric heat balance calorimeter. Final report, 3:45268 (NUREG/CR—0054)
First mechanized in-service inspection of EBR-II steam generator, 3:44778 (ANL—77-46)
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213—11)
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA—11(Vol.1)(Draft))
Nucleation and evolution of slag droplets in coal combustion, 3:44132 (CONF-780307—8)
Parametric study of turbine systems for compressed air energy storage plants, 3:44836 (ANL/ES—64)
Perspectives on fish impingement, 3:44622 (CONF-771231—3)
Recent advances in SQUID NMR techniques, 3:45138 (CONF-780339—3)
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101—9)
Supportive studies in fluidized-bed combustion. Quarterly report, July—September 1977, 3:44131 (ANL/CEN/FE—77-8)
$TbCl_3$—$AlCl_3$ vapors: characteristics of a potential new high energy gas phase laser medium, 3:45162 (CONF-780202—21)
Two-phase flow measurement by radioactive tracer techniques, 3:44798 (CONF-771126—8)

Two-phase liquid-metal MHD generator experiments and pressure-gradient correlations, 3:44902 (CONF-780336—1)
Water resources research program. Pollution of coastal waters off Chicago by sinking plumes from the Indiana Harbor Canal, 3:45327 (ANL/WR—77-2)
Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes, 3:45360 (ANL/WR—77-3)

Arizona Univ., Tucson (USA). Engineering Experiment Station
Convection in the closed Brayton cycle. Annual summary report No. 3, 1 April 1976—31 March 1977, 3:45242 (AD-A—047262)

Army Construction Engineering Research Lab., Champaign, Ill. (USA)
The building loads analysis and system thermodynamics (BLAST) program. Volume I. User's manual. Final report, 3:44921 (AD-A—048734)

Army Facilities Engineering Support Agency, Fort Belvoir, Va. (USA). Research and Technology Div.
Building heating energy consumption at fixed facilities. Final report, April—June 1977, 3:44947 (AD-A—048324)

Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. (USA)
Capability for intrusion detection at nuclear fuel sites, 3:44309 (NUREG/CR—0027)

Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.
Adjuster rod experiments in ZED-2, 3:44674 (AECL—5853)
CONIFERS: a neutronics code for reactors with channels, 3:44730 (AECL—5305)
Dynamic simulation of a reboiler, 3:44664 (AECL—5680)
Effects of various treatments on the serviceability of water-immersed carbon-steel ball bearings, 3:44668 (AECL—5823)
Flow-induced vibration analysis of heat exchanger and steam generator designs, 3:44671 (AECL—5826)
Flow-induced vibration of nuclear power station components, 3:44673 (AECL—5852)
Flux distribution measurements in the Bruce A unit 1 reactor, 3:44672 (AECL—5833)
Future of high intensity accelerators in nuclear energy, 3:45246 (AECL—5903)
INMACS - An approach to on-line nuclear materials accounting and control in a fuel fabrication environment, 3:44305 (AECL—5902)
In-reactor measurement of fuel-to-sheath heat transfer coefficients between UO_2 and stainless steel, 3:44770 (AECL—5400)
Measurement of a relative conversion ratio in 19-element ThO_2-UO_2 fuel, 3:44670 (AECL—5825)
Measurement of crystallographic texture at Chalk River Nuclear Laboratories, 3:45009 (AECL—5626)
Overview of the potential of the CANDU reactor as a thermal breeder, 3:44663 (AECL—5679)
Review of session V of the ANS topical meeting, St. Charles, Il., USA, May 1977: "Mechanisms for pellet cladding interactions", 3:44771 (AECL—5850)
Tables of the isotopic composition of transuranium elements produced in Canadian D_2O moderated reactors, 3:44675 (AECL—5904)
Testing of unlubricated water-immersed carbon-steel ball bearings, 3:44669 (AECL—5824)
Valve maintainability in CANDU-PHW nuclear generating stations, 3:44676 (AECL—5913)

Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment
Performance of highly rated UO_2 fuel in the WR-1 organic-cooled reactor, 3:44777 (AECL—5399)
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 1: starting materials: uranium ore, separated uranium and uranium mill tailings, and Part 2: irradiated fuel, 3:44661 (AECL—4436/1)
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 3: reprocessed fuel: plutonium product, and high level waste, 3:44264 (AECL—4436/2)
Study of the running-in period of a CANDU-PHW thorium converter, 3:44662 (AECL—5391)
Utilization of waste heat from electricity generating stations, 3:44869 (AECL—5689)

Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects
Nuclear power reactor safety, 3:44793 (AECL—5694)

Atomics International Div., Canoga Park, Calif. (USA)
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January—March 1978, 3:44685 (AI-DOE—13231)

Atomics International Div., Golden, Colo. (USA). Rocky Flats Plant
Evaluation of plasma arc welding capabilities and applications, 3:45134 (RFP—2722)

Atomics International Div., Richland, Wash. (USA). Rockwell Hanford Operations
Assessment of Hanford burial grounds and interim TRU storage, 3:44292 (RHO-CD—78(Rev.))

Atominstitut der Oesterreichischen Hochschulen, Vienna
Apparatuses for the dissolution of resistent nuclear fuel for analytical sample preparation, 3:44265 (AIAU—77503)

Avco Corp., Wilmington, Mass. (USA). Systems Div.
ARC-coal acetylene process development program. Quarterly technical progress report No. 1, 9 January—31 March 1978, 3:44073 (TID—28423)

Avco-Everett Research Lab., Everett, Mass. (USA)
Visible laser discharge studies. Quarterly progress report, December 1, 1976—February 28, 1977, 3:45163 (COO—2922-1)
Visible laser discharge studies. Quarterly progress report, June 1, 1977—August 31, 1977, 3:45164 (COO—2922-3)

B

Babcock and Wilcox Co., Lynchburg, Va. (USA). Materials and Chemical Technology Lab.
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976—June 1977, 3:44041 (FE—2218-11)

Badger Plants, Inc., Cambridge, Mass. (USA)
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977—October 28, 1977, 3:44044 (FE—2416-20)

Battelle Columbus Labs., Ohio (USA)
Catalyst development program for hydrodesulfurization and liquefaction of coal to produce clean boiler fuels. Monthly report, April 1978, 3:44066 (FE—2321-31)
End effects on elbows subjected to moment loadings, 3:44760 (ORNL/Sub—2913/7)
Evaluation of the commercial feasibility of hydrogen production by the solar photoelectrolysis of water. Task I interim report, 3:44390 (TID—27802)
Maximum energy efficiency improvement target for SIC 28: Chemical and Allied Products Industry, 3:44955 (FEA/D—77/243)
Review of current interest and research in water hyacinth-based wastewater treatment. Final report, 3:44966 (N—77-33683)

Battelle Pacific Northwest Labs., Richland, Wash. (USA)
Critical separation between subcritical clusters of 4.29 wt % ^{235}U enriched UO_2 rods in water with fixed neutron poisons, 3:45149 (NUREG/CR—0073)
Electromagnetic methods for inspection of ferrous tubing, 3:45222 (BN-SA—311)
Handbook of critical experiments benchmarks, 3:45150 (PNL—2700)
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL—2607)
Process for cleaning and removal of sulfur compounds from low Btu gases. Quarterly summary report, January—March 1978, 3:44031 (PNL—2040-9)

Bayerische Elektrizitaets, Muenchen (Germany, F.R.)
Experiences with heat recovery from waste water, 3:44922 (AED-Conf—1977-072-007)

Bechtel Corp., San Francisco, Calif. (USA)
EPA alkali scrubbing test facility: advanced program. Progress report No. 3, February—November 1976, 3:44625 (PB—274544)

Bendix Corp., Kansas City, Mo. (USA)
N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX—613-1955(Rev.))

Bettis Atomic Power Lab., Pittsburgh, Pa. (USA)
Method for measurement of relative differences in thermal expansion coefficients (LWBR development program), 3:44698 (WAPD-TM—1134)
Bettis Atomic Power Lab., West Mifflin, Pa. (USA)
Detection of radioactive surface and weld contamination (ThO_2 and $^{233}UO_2$) on light water breeder reactor fuel rods using alpha ionization detectors (LWBR development program), 3:44697 (WAPD-TM—1130)
Bituminous Coal Research, Inc., Monroeville, Pa. (USA)
Gas generator research and development: TRI-GAS process. Volume II. Appendix. Sections I through V. Final report, August 21, 1973—October 20, 1977, 3:44035 (FE—1527-43(Vol.2))
Gas generator research and development: TRI-GAS process. Volume III. Appendix. Sections VI through XIV. Final report, August 21, 1973—October 20, 1977, 3:44036 (FE—1527-43(Vol.3))
Boeing Aerospace Co., Seattle, Wash. (USA). Electric Power Technology Div.
Review of electrochemical impregnation for nickel/cadmium cells, 3:44852 (N—77-33601)
Brigham Young Univ., Provo, Utah (USA)
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20—December 20, 1977, 3:44048 (FE—2729-1)
Brigham Young Univ., Provo, Utah (USA). Dept. of Chemical Engineering
Mixing and gasification of coal in entrained flow systems. Quarterly technical progress report No. 2, July 1—September 30, 1977, 3:44047 (FE—2666-2)
Brookhaven National Lab., Upton, N.Y. (USA)
Conditions for product form network solution through the analysis of finite queues with overflows, 3:46134 (BNL—24181)
GAUSSIAN 76: an ab initio molecular orbital program, 3:45544 (BNL—24136)
Hydrogen isotope exchange in metal hydride columns, 3:45122 (BNL—50755)
Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison, 3:45827 (BNL—24330)
Mobile prompt-gamma in vivo neutron activation facility, 3:45379 (BNL—24290)
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL—24177)
Brown Univ., Providence, R.I. (USA). Dept. of Physics
Nonlinear sound generation by high energy particles, 3:45861 (COO—3130TA-341)
Building Research Association of New Zealand (Inc.)
Annual heating energy demand of heavy domestic buildings. Report No. 16, 3:44940 (NP—23142)
Bundesgesundheitsamt, Neuherberg (Germany, F.R.). Inst. fuer Strahlenhygiene
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr—29)
Bureau of Land Management, Washington, D.C. (USA)
Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report, 3:44860 (PB—274411)
Bureau of the Census, Washington, D.C. (USA)
Environmental quality control - governmental finances: fiscal year 1974—1975. State and local government special studies, 3:45299 (PB—275760)
Burns and Roe Industrial Services Corp., Paramus, N.J. (USA)
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL—50777)

C

California Energy Resources Conservation and Development Commission, Sacramento (USA). Alternatives Div.
Coal utilization and conversion technologies: state-of-the-art, 3:44135 (NP—23211)
California State Univ., Hayward (USA). Dept. of Biological Sciences
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL—13849)
California Univ., Berkeley (USA)
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June—31 August 1977, 3:45053 (FE—2299-15)
California Univ., Berkeley (USA). Dept. of Geology and Geophysics
Microcracks and matrix deformation in stressed gas-bearing sandstones, 3:44193 (UCRL—80328)
California Univ., Berkeley (USA). Dept. of Mechanical Engineering
Inhibition effects on extinction of polymer burning, 3:45129 (LBL—6898)
California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL—6815)
Computer performance management at LBL, 3:46141 (UCID—3994)
Design of a mobile laboratory for ventilation studies and indoor air pollution monitoring, 3:44938 (LBL—7817)
Discussion of heat mirror film: performance, production process, and cost estimates, 3:44925 (LBL—7812)
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL—5962)
High resolution and high voltage electron microscopy at the University of California, Berkeley, 3:45010 (LBL—6998)
Nine-fold way: a tutorial in successful performance management, 3:46138 (LBL—7256)
Reliability of wind power from dispersed sites: a preliminary assessment, 3:44602 (LBL—6889)
Small-amplitude periodic sloshing modes of a liquid in a vertical right circular cylinder with a concave spheroidal bottom, 3:45549 (LBL—7204)
Two detector MWPC position camera with honeycomb lead converters for medical imaging: performance and developments, 3:45254 (LBL—7205)
California Univ., Davis (USA)
Numerical modeling of unsteady flame propagation, 3:45130 (SAND—77-8275)
California Univ., Livermore (USA). Lawrence Livermore Lab.
Analytical study of intake tuning for helical-rotor expanders, 3:45136 (UCRL—52449)
Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL—13801)
Blast forecasting guide for the Site 300 Meteorology Center, 3:45281 (UCID—17822)
BWR pool dynamics in a loss of coolant accident. Calculation of the air-venting phase, 3:44818 (UCRL—52435)
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID—17744-78-2)
Computer simulations of a 1/5-scale experiment of a Mark I boiler water reactor pressure-suppression system under hypothetical LOCA conditions, 3:44815 (UCID—17782)
Data Director system manual, 3:46142 (UCID—17749)
Development of control algorithms for chemistry systems. Final report, September 1, 1978—September 30, 1977, 3:45109 (UCRL—13826)
Effect of simultaneous and sequential detonation on explosive-induced fracture, 3:45076 (UCRL—80390)
Effective mass and damping of submerged structures, 3:44817 (UCRL—52342)
Feasibility study for computerized automation of EPA Region II Technical Support Branch, 3:45303 (UCRL—52426)
Hoe Creek II field experiment on underground coal gasification, preliminary results, 3:44056 (UCRL—80592)
Hydrodynamic modeling of fluidized-bed gasifiers and combustors, 3:44054 (UCID—17759)
LLL in situ coal gasifiction program. Annual report Fiscal Year 1977, October 1976—September 1977, 3:44055 (UCRL—50032-77)
Mechanical Engineering Department quarterly report, January—March 1978, 3:45132 (UCRL—50016-78-1)
Microcracks and matrix deformation in stressed gas-bearing sandstones, 3:44193 (UCRL—80328)
New developments in ultrasonic imaging of the chest and other body organs, 3:45381 (UCRL—80340(Rev.1))

Optical inspection of small-diameter deep bores using rod optics with low-light television and still photography, 3:45224 (UCRL—52431)
Organic Materials Division quarterly report, January—March 1977, 3:45078 (UCRL—50019-77-1)
Titrimetry is alive and well at LLL, 3:45110 (UCRL—80878)
Two-dimensional computer simulation of hypervelocity impact cratering: some preliminary results for Meteor Crater, Arizona, 3:45433 (UCRL—80539)

California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3':5'-cyclic monophosphate levels in primary cultures of glia, 3:45367 (UCLA—12-1145)
Hormonal effects on differentiation in neutral cultures, 3:45371 (UCLA—12-1144)

Calspan Corp., Buffalo, N.Y. (USA)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974—April 1977, 3:45300 (PB—276169)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume II. Primary and secondary nonferrous smelting and refining. Final report, May 1974—April 1977, 3:45301 (PB—276170)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume III. ferrous smelting and refining. Final report, May 1974—April 1977, 3:45364 (PB—276171)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume IV. Appendices. Final report, May 1974—April 1977, 3:45365 (PB—276172)

Canadian Nuclear Association, Toronto, Ontario
Nuclear energy and society. Volume 4. Nuclear energy and the industry (part 1), 3:44729 (CONF-760688—)

Carnegie-Mellon Univ., Pittsburgh, Pa. (USA). Dept. of Metallurgy and Materials Science
Some observations on the structure of Ti—11.5Mo—6Zr—4.5Sn (beta III) as affected by processing history. Technical report, 3:45007 (AD-A—048772)
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti—11.5Mo—6Zr—4.5Sn (beta III). Technical report, 3:45008 (AD-A—048773)

Catalytic, Inc., Wilsonville, Ala. (USA)
Solvent refined coal (SRC) process. Operation of solvent refined coal pilot plant at Wilsonville, Alabama. Monthly technical progress report, March 1978, 3:44063 (FE—2270-29)
Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April—June 1977, 3:44062 (FE—2270-24)

CEA, 75 - Paris (France). Direction des Applications Militaires
Neutron bomb, 3:45287 (LA-tr—78-48)

Center for Natural Areas, Washington, D.C. (USA)
Improving regulatory effectiveness in Federal/State siting actions. Need for power: determinants in the state decisionmaking processes, 3:44712 (NUREG/CR—0022)

Champion-Edison, Inc., Edison, N.J. (USA)
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1—May 31, 1977, 3:44067 (FE—2353-17)

Chem Systems, Inc., New York (USA)
Liquid phase methanation pilot plant installation and operation. Quarterly report, October 1, 1976—December 31, 1976, 3:44039 (FE—2036-21)
Liquid phase methanation pilot plant operation and laboratory support work. Quarterly report, October 1, 1977—December 31, 1977, 3:44040 (FE—2036-24)

Chevron Research Co., Richmond, Calif. (USA)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, October—December 1977, 3:44208 (FE—2315-22)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July—September 1977, 3:44065 (FE—2315-19)

Chicago Univ., Ill. (USA)
Coal anion structure and chemistry of coal alkylation. Fourth quarterly progress report, December 1, 1977—February 28, 1978, 3:44074 (COO—4227-4)

Clemson Univ., S.C. (USA). Dept. of Civil Engineering
Planning, design, and construction of nuclear power plants: an overview. Final report, 3:44635 (COO—4121-2)

Colorado Div. of Water Resources, Denver (USA)
Analyses of methods for the determination of water availability for energy development, 3:44854 (PB—274080)

Colorado School of Mines, Golden (USA)
Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977, 3:44217 (USGS-CIRC—753)

Colorado School of Mines, Golden (USA). Dept. of Geophysics
Behavior of electric potential fields over randomly layered earth models. Doctoral thesis, 3:45432 (AD-A—046975)
Exploration for geothermal energy on Oahu, Hawaii. Final report, 3:44570 (AD-A—046954)

Colorado State Univ., Fort Collins (USA)
Analyses of methods for the determination of water availability for energy development, 3:44854 (PB—274080)

Combustion Engineering, Inc., Windsor, Conn. (USA)
Environmental considerations for low-Btu gasification of coal for electric power generation, 3:44037 (FE—1545-44)

Combustion Power Co., Inc., Menlo Park, Calif. (USA)
Granular bed filter development program. Quarterly report, July—September 1977, 3:44028 (FE—2579-13)

Commission of the European Communities, Brussels (Belgium)
Communities R and D Programme: radioactive waste management and storage. 1. Annual progress report, 3:44277 (EUR—5749)
Handbook of materials testing reactors and ancillary hot laboratories in the European Community, 3:44790 (EUR—5369)
Separation and recycling of actinides: a review of the state of the art, 3:44279 (EUR—5801)

Commission of the European Communities, Ispra (Italy). Joint Research Centre
Post irradiation examination of the fuel discharged from the Trino Vercellese reactor after the 2nd irradiation cycle, 3:44648 (EUR—5605)
Probabalistic analysis of the protection of a PWR against overpressure, 3:44804 (EUR—5640)

Commission of the European Communities, Karlsruhe (Germany, F.R.). European Inst. for Transuranium Elements
Post irradiation examination of the fuel discharged from the Trino Vercellese reactor after the 2nd irradiation cycle, 3:44648 (EUR—5605)

Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center
Prototype experiment of an irradiation facility for large HTR fuel specimens in the HFR Petten. Project E 91 - 0, 3:44779 (EUR—5456)

Compagnia Mediterranea Prospezioni, Rome (Italy)
Seismic research in the Larderello area: first results, 3:44580 (NP—22785)

Consiglio Nazionale delle Ricerche, Pisa (Italy). Istituto Internazionale per le Ricerche Geotermiche
Seismic research in the Larderello area: first results, 3:44580 (NP—22785)

Consolidated Controls Corp., El Segundo, Calif. (USA)
Coal gasification valves: Phase II. Quarterly technical progress report, September 1977—November 1977, 3:44042 (FE—2355-2(Rev.E))

Cornell Univ., Ithaca, N.Y. (USA)
Research on molecular lasers. Final report, 1 October 1968—30 September 1976, 3:45159 (AD-A—048643)

Cornell Univ., Ithaca, N.Y. (USA). Dept. of Materials Science and Engineering
Direct observation of the point-defect structure of depleted-zones in ion-irradiated metals, 3:45055 (COO—3158-62)

Corporate Unverified
Analysis of interrelation of hot spring waters using a multi-component concentration correlation matrix, 3:44574 (CONF-7610123—6)
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP—22840)
Geochemical geothermal exploration in Noya geothermal field, 3:44587 (CONF-7610123—5)
Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields, 3:44586 (CONF-7410177—3)
Geothermal energy, 3:44578 (CONF-7608107—1)

Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP—22298)
Rock drilling and crushing methods: congealing crush of hot dry rock, 3:44595 (CONF-770754—1)
Rock-water solution systems in geothermal fields, 3:44601 (CONF-7610123—4)
Council for Scientific and Industrial Research, Pretoria (South Africa)
Microspheres containing Nay zeolite synthesized from a South African kaolinite. (Precursor for a fluidized bed cracking catalyst), 3:44158 (PB—274450)
Council on Environmental Quality, Washington, D.C. (USA)
Environmental quality. The sixth annual report of the Council on Environmental Quality, 3:45293 (NP—23191)
Curtiss-Wright Corp., Wood-Ridge, N.J. (USA). Power Systems Div.
High temperature turbine technology program: Phase I. Topical report. Phase III preliminary turbine sub-system technology readiness verification program plan, 3:44616 (FE—2291-12)

D

Dalhousie Univ., Halifax, Nova Scotia (Canada). Inst. of Oceanography
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL—24177)
Delaware Univ., Newark (USA). Coll. of Marine Studies
Field investigations of convergences and slick concentration mechanisms in Delaware Bay. (Research on the effects of crude oil transfer and upstream refineries on Delaware Bay), 3:45332 (PB—275692)
Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center
Refining of shale oil, 3:44207 (BERC/IC—77/3)
Western gas sands project. Status report, 3:44196 (NVO—0655-105)
Department of Energy, Las Vegas, Nev. (USA). Nevada Operations Office
Assessment of the Nevada Test Site for low-level waste management, 3:44291 (NVO—193)
Department of Energy, Mines and Resources, Ottawa, Ontario (Canada). Canada Centre for Mineral and Energy Technology
Disposal of solid wastes and liquid effluents from the milling of uranium ores, 3:44289 (CANMET—76-19)
Department of Energy, Morgantown, W.Va. (USA). Morgantown Energy Research Center
Fluidized-bed combustion test of low-quality fuels: Texas lignite and lignite refuse, 3:44134 (MERC/RI—78/3)
Department of Energy, Oak Ridge, Tenn. (USA). Technical Information Center
Reactor safety: a literature search, 3:44814 (TID—3525-R5-S11)
Department of Energy, Washington, D.C. (USA)
Draft environmental impact statement. Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico, 3:45324 (DOE/EIS—0018-D)
Environmental Development Plan (EDP). Oil supply. FY 1977, 3:44185 (DOE/EDP—0024)
Department of Energy, Washington, D.C. (USA). Div. of Biomedical and Environmental Research
Recommendations for CAMAC Serial Highway drivers and LAM Graders for the SCC-L2 Serial Crate Controller, 3:46137 (DOE/EV—0006)
Department of Energy, Washington, D.C. (USA). Div. of Energy Storage Systems
Battery and electrochemical systems program summary, FY 1977, 3:44849 (DOE/ET—0014)
Hydrogen Energy Storage Program: five-year plan, 3:44326 (DOE/ET—0046)
Department of Energy, Washington, D.C. (USA). Div. of Environmental Control Technology
Formerly utilized MED/AEC sites remedial action program. Radiological survey of site A, Palos Park Forest Preserve, Chicago. Final report, 3:44301 (DOE/EV—0005/7)
Department of Energy, Washington, D.C. (USA). Div. of Environmental Impact
Energy-related environmental computer graphics systems in the Department of Energy Laboratories, 3:46135 (CONF-7706110—)
Department of Energy, Washington, D.C. (USA). Div. of Magnetohydrodynamics
Interelectrode arcs and electrical fluctuations in an MHD channel, 3:44901 (CONF-770402—3)
Department of Energy, Washington, D.C. (USA). Div. of Solid Fuels Mining and Preparation
Chainless haulage systems for power loaders. Information circular as of April 1978, 3:44094 (FE—SFMP-1(78))
Department of Transportation, Cambridge, Mass. (USA). Transportation Systems Center
Disaggregated financial data and analysis for the domestic motor vehicle manufacturers. Technical report, 3:44857 (PB—275826)
Donaldson Co., Inc., Minneapolis, Minn. (USA). Protective Systems Dept.
Evaluation of the use of air curtains to increase face ventilation. Final report, April 1975—March 1977, 3:44096 (PB—274324)
Dow Chemical Co., Midland, Mich. (USA). Hydrocarbons and Energy Research Dept.
Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October—December 1977, 3:44203 (FE—2346-20)
Duke Univ., Durham, N.C. (USA). Dept. of Electrical Engineering
User's manual: computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters, 3:44835 (N—77-33602)
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
Effect of internal alpha radiation on borosilicate glass containing Savannah River Plant waste, 3:44290 (DP—1482)
Geology of the Raleigh 1° x 2° Quadrangle, North Carolina, 3:44212 (GJBX—51(78))
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP—1469)
Recovery of plutonium from carbon analysis residues, 3:45115 (DP—1495)
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Plant
Computerized radionuclidic analysis in production facilities, 3:45111 (DPSPU—77-30-10)

E

EA and T Co., Inc., Marina del Rey, Calif. (USA)
Environmental effects on metal structures and connection in NFS waste tanks, 3:44294 (UCRL—13837)
Evaluation of the integrity of existing NFS waste tanks, 3:44295 (UCRL—13839)
Review of liquid-tank interaction analysis technique, 3:44293 (UCRL—13835)
Eberline Instrument Corp., Santa Fe, N.Mex. (USA)
Rio Blanco radiation contamination clearance report, 3:45285 (PNE-RB—79)
ECON, Inc., Princeton, N.J. (USA)
Economics of fusion research, 3:46081 (COO—4181-1)
Economics Research Associates, San Joaquin, Calif. (USA)
Economic adjustment strategy study for San Joaquin County, California, 3:44963 (PB—274556)
Educational Facilities Labs., Inc., New York (USA)
Report on the development of a model energy conservation program for New York State schools. Report on phase 1, January—July 77, 3:44948 (PB—274285)
Electric Power Research Inst., Palo Alto, Calif. (USA)
Supply 77: EPRI annual energy supply forecasts, 3:44876 (EPRI-EA—634-SR)
Energy Research and Development Administration, Washington, D.C. (USA). Div. of Reactor Development and Demonstration
Design and economics of large LMFBRs, 3:44693 (HEDL-SA—1321)
Ente Nazionale per l'Energia Elettrica, Florence (Italy)
Seismic research in the Larderello area: first results, 3:44580 (NP—22785)
Ente Nazionale per l'Energia Elettrica, Pisa (Italy). Centro di Ricerca Geotermica
Seismic research in the Larderello area: first results, 3:44580 (NP—22785)

Ente Nazionale per l'Energia Elettrica, Rome (Italy)
Post irradiation examination of the fuel discharged from the Trino Vercellese reactor after the 2nd irradiation cycle, 3:44648 (EUR—5605)
Ten-yearly report on operations at the Garigliano nuclear power station. Progress report 1 May 1964-31 December 1973, 3:44640 (EUR—5649)
Environmental Protection Agency, Research Triangle Park, N.C. (USA)
National air quality and emissions trends report, 1976, 3:45292 (EPA—450/1-77-002)
Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis, 3:45422 (PB—274339)
Environmental Protection Agency, Research Triangle Park, N.C. (USA). Office of Air Quality Planning and Standards
Control of volatile organic emissions from solvent metal cleaning, 3:45322 (PB—274557)
Environmental Protection Agency, Washington, D.C. (USA). Office of Solid Waste Management Programs
Information about hazardous waste management facilities, 3:44964 (PB—274881)
Exxon Nuclear Co., Inc., Richland, Wash. (USA)
Fuel performance improvement program. Quarterly progress report, October—December 1977, 3:44639 (COO—4066-5)
Exxon Research and Engineering Co., Linden, N.J. (USA). Government Research Lab.
Redox bulk energy storage system study. Volume 1. Final report, 18 February 1976—30 January 1977, 3:44908 (N—77-33608)
Redox bulk energy storage system study. Volume 2. Final report, 18 February 1976—30 January 1977, 3:44909 (N—77-33609)

F

Falcon Research and Development Co., Buffalo, N.Y. (USA)
Fuel economy of automotive vehicles: a compendium of statistical techniques, 3:44952 (HCP/M6037—01)
Federal Coordinating Council for Science, Engineering and Technology, Washington, D.C. (USA). Committee on Water Resources Research
Directions in U.S. water research: 1978—1982. Final draft report, 3:44862 (PB—274278)
Federal Energy Administration, Washington, D.C. (USA)
Draft environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company, 3:44329 (DES—77-1)
Final environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company, 3:44330 (FES—77-1)
Task force on compliance and enforcement. Final report. Volume 2, 3:44186 (DOE/ERA—0006(Vol.2))
Federal Energy Administration, Washington, D.C. (USA). Office of Energy Conservation and Environment
Study of energy conservation potential in the meat packing industry, 3:44954 (FEA/D—76/291)
Federal Power Commission, Washington, D.C. (USA)
The 1976 Alaska power survey. Volume 2, 3:44893 (PB—274081)
Florida State Univ., Tallahassee (USA). Dept. of Chemistry
High-sensitivity Fourier transform NMR. Intermolecualr interactions between environmental toxic substances and biological macromolecules. Report for 2 October 1974—1 October 1976, 3:45297 (PB—274011)
Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)
Laboratory research on tailings stabilization methods and their effectiveness in radiation containment, 3:45314 (GJT—21)
Forest Products Lab., Madison, Wis. (USA)
Structural feasibility of parallel-laminated veneer crossarms. Forest Service research paper, 3:44627 (AD-A—048278)
Fuji Electric Co. Ltd., Yokosuka, Kanagawa (Japan). Central Research Lab.
6250 kVA superconducting generator, 3:45140 (NP—23197)

G

Gama Research Centre, Jogyakarta (Indonesia)
Preliminary study on plasma physics and its applications, 3:45952 (PPGM—R95-76)
General Accounting Office, Washington, D.C. (USA)
Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED—78-93)
Marine approaches to U.S. ports: a flexible and obstruction-free system is needed, 3:44883 (CED—78-107)
Pipeline safety: need for a stronger Federal effort, 3:45155 (CED—78-99)
Summary of problems associated with coal reserve estimates, 3:44092 (EMD—78-23)
General Atomic Co., San Diego, Calif. (USA)
Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL—13801)
COCO: a computer program for seismic analysis of a single column of the HTGR core, 3:44805 (GA-A—14600)
Containment Atmosphere Response (CAR) program status report, 3:44806 (GA-A—14699)
Evaluation and recommendations on U.C. Lawrence Livermore Labortory Quality Assurance Program, 3:46086 (UCRL—13834)
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978, 3:44657 (GA-A—14863)
HTGR steam cycle configuration evaluation report, 3:44658 (GA-A—14900)
Review of methods for the integration of reliability and design engineering, 3:44807 (GA-A—14748)
Tensile tests of 2500-kip prestressing tendons for the PCRV, 3:44656 (GA-A—14768)
Thermal stress analysis of the 300-MW(e) gas-cooled fast breeder reactor grid plate, 3:44690 (GA-A—14766)
General Electric Co., Philadelphia, Pa. (USA). Space Div.
Chemical laser potential of selected group IV-A metal oxides. Final report, 3:45161 (AD-A—048779)
General Electric Co., Philadelphia, Pa. (USA). Space Sciences Lab.
Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1—June 30, 1976, 3:44900 (FE—2238-1)
Laboratory studies of silicon vapor deposition, Phase A. Final report, 3:44359 (N—77-33296)
General Electric Co., Schenectady, N.Y. (USA). Gas Turbine Div.
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1—December 30, 1977, 3:44615 (FE—1765-42)
Overall Plant Design Description (OPDD), low-Btu CO gas electric power plant, 3:44607 (FE—1806-23)
General Electric Co., Sunnyvale, Calif. (USA). Fast Breeder Reactor Dept.
Interim evaluation of Sodium—Water Reaction Test No. 1 data and comparison with TRANSWRAP analyses: Series I large leak test program, 3:44691 (GEFR—00027(L))
Localized duct wall cyclic thermal stresses in vented assembly LMFBR cores, 3:44692 (GEFR—00351)
General Electric Co., Wilmington, Mass. (USA). Aircraft Equipment Div.
Solid polymer electrolyte (SPE) fuel cell technology program, phase 2/2a. Final report, 3:44913 (N—77-33606)
Solid polymer electrolyte (SPE) fuel cell technology program, phase 1/1a. Final report, 3:44907 (N—77-33605)
General Physics Corp., Columbia, Md. (USA)
Performance measurement system for training simulators. Interim report, 3:44773 (EPRI-NP—783)
Geological Survey, Arlington, Va. (USA)
Bibliography of the geology of the Green River Formation, Colorado, Utah, and Wyoming, to March 1, 1977, 3:44199 (CIRC—754)
Geonomics, Inc., Berkeley, Calif. (USA)
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 3:44600 (SAN—1326-1/1)

Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (Germany, F.R.)
Calculation of potential danger of stored wastes, 3:44304 (ORNL-tr—4598)
Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii
Data preparation for calculations with the Monte-Carlo method on the base of the 26-group constant system, 3:44733 (IAE—2526)
Great Plains Agricultural Council (USA)
Energy-related impacts on Great Plains agricultural productivity in the next quarter century, 1976—2000. Great plains agricultural council publication, 3:44959 (PB—274136)
Grumman Aerospace Corp., Bethpage, N.Y. (USA)
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975—31 March 1977, 3:45001 (AD-A—048485)
Gulf Research and Development Co., Pittsburgh, Pa. (USA)
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly report, July—September 1976, 3:44033 (FE—2305-3)
Research and development as an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. Quarterly report, September—November 1977, 3:44060 (FE—1800-21)

H

Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Kernchemie und Reaktor
Calculation of the influence of a thermal shield on the neutron flux and on the tritium production in a fusion reactor blanket, 3:46090 (HMI-B—235)
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B—188)
Hanford Engineering Development Lab., Richland, Wash. (USA)
Automatic surface flaw inspection of nuclear fuel pellets, 3:44260 (HEDL-SA—1409)
Biases for current FFTF calculational methods, 3:44780 (HEDL-SA—1393)
Design and economics of large LMFBRs, 3:44693 (HEDL-SA—1321)
FFTF emergency plan, FSAR amendment 9, 3:44781 (HEDL-TI—75002-9)
Friction, wear, and corrosion of laves-hardened nickel alloy hardsurfacing in sodium, 3:44695 (HEDL-SA—1391)
Tritium permeation through oxidized 304 and 316 stainless steel, 3:44694 (HEDL-SA—1326)
Hitachi Ltd., Tokyo (Japan)
Report on radio frequency plugging research (3rd report), 3:45888 (UCRL-Trans—11347)
Hughes Aircraft Co., El Segundo, Calif. (USA)
ATS-6 solar cell experiment/improvement. Final report, 1 January—31 December 1976, 3:44393 (N—77-33607)
Hughes Research Labs., Malibu, Calif. (USA)
Ion plasma electron gun research. Final report, 1 June—15 November 1977, 3:45158 (AD-A—048621)

I

ICF, Inc., Washington, D.C. (USA)
Energy and economic impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976). Final report, 3:44141 (PB—274632)
Energy and economic impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976). (appendices). Final report, 3:44142 (PB—274633)
Idaho National Engineering Lab., Idaho Falls (USA)
Fatigue life of LOFT Class I pipe welds, 3:44782 (LTR—11-20(Rev.B.))
Fission product and reactor dosimetry studies at Coupled Fast Reactivity Measurements Facility, 3:44785 (TREE—1259)
LOFT pressurizer surge and spray line piping thermal analysis, Class I review, 3:44783 (LTR—1144-36)
Neutronics analysis of the low proliferating gas core reactor, 3:44731 (CONF-780401—7)
Illinois Inst. of Tech., Chicago (USA)
Experimental study of bank aerodynamics of atmospheric spray cooling systems, 3:44611 (COO—4531-1)
Illinois Univ., Chicago (USA). Dept. of Energy Engineering
Modeling of a fluidized bed combustor with immersed tubes. Quarterly report, March—August 1977, 3:45231 (FE—1787-8)
Illinois Univ., Urbana (USA)
Raman studies of hydrogen vibrational modes in palladium, 3:45118 (COO—1198-1212)
Indiana Univ., Bloomington (USA). School of Law
Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report, 3:44624 (PB—274395)
Ingersoll-Rand Research, Inc., Princeton, N.J. (USA)
Deep cutting continuous miner. (effect of drum rotational speed and depth of cut on airborne respirable dust and specific energy). Final report, January 1972—December 1976, 3:44097 (PB—274345)
Development of a continuous dry coal screw feeder: Phase II. Quarterly technical progress report, April 1, 1977—June 30, 1977, 3:44038 (FE—1794-25)
Institute of Gas Technology, Chicago, Ill. (USA)
Experimental program for the development of peat gasification. Interim report No. 3. Coiled tube reactor experiments, 3:44045 (FE—2469-17)
Institute of Meteorology and Water Management, Warsaw (Poland)
Supplement to effects of thermal discharges on physico-chemical processes and water quality, Vistula River, Poland. Final report, January 1973—December 1975, 3:45361 (PB—273580)
Institut Franco-Allemand de Recherches de Saint-Louis, 68 (France)
Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2. Further development and optimization of the chemical CO-laser, 3:45167 (N—77-33514)
Photographic study of rapid events by picosecond techniques, 3:45904 (N—77-33495)
Instituto Costarricense de Electricidad, San Jose
Guanacaste Geothermal Project. Technical prefeasibility report. Annex A. Geology, 3:44577 (NP—23014)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP—23013)
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP—22850)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex E. Geohydrology, 3:44576 (NP—23011)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex C. Electric resistivity, 3:44581 (NP—23012)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex F. Heat flow, 3:44582 (NP—23015)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex D. Gravimetry, 3:44583 (NP—23016)
Intermountain Technologies, Inc., Idaho Falls, Idaho (USA)
Comparison of experimental results with analytical predictions for LOFT nonnuclear tests with core simulator. Final report, 3:44803 (EPRI-NP—800)
International Atomic Energy Agency, Vienna (Austria)
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy, 3:45398 (STI/PUB—441(Vol.1))
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy, 3:45399 (STI/PUB—441(Vol.2))
International Business Machines Corp., Huntsville, Ala. (USA)
User's guide to the monthly performance report of the National Solar Data Program, 3:44441 (SOLAR/0004—78/18)
International Energy Agency, 75 - Paris (France)
Will there be an energy crisis in 1985, 3:44875 (CONF-780444—1)
International Nickel Co., Inc., Suffern, N.Y. (USA)
Development and evaluation of high chromium weld deposited overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Technical status report, January 1—January 31, 1978, 3:45004 (TID—28288)

Interstate Oil Compact Commission, Oklahoma City, Okla. (USA)
Oil and Gas Compact Bulletin. Volume 36, Number 1, July 1977, 3:44150 (CONF-770757—)
Iowa State Univ. of Science and Technology, Ames (USA)
No-bake systems in modern foundry technology, 3:44958 (IS-M—145)
Iowa State Univ. of Science and Technology, Ames (USA). Energy and Mineral Resources Research Inst.
Action of aqueous alkali on pyrite, 3:44030 (IS-ICP—51)
Comparison of coal beneficiation methods, 3:44123 (IS-ICP—50)
Desulfurizing coal with solutions containing dissolved oxygen, 3:44029 (IS-ICP—48)
Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy
Electromagnetic plasma wave emissions from the auroral field lines, 3:45483 (N—77-33387)
IRT Corp., San Diego, Calif. (USA)
Formation temperature gauge feasibility study. Volume II, 3:44584 (SAN—0936P48-1)

J

Japan Atomic Energy Research Inst., Tokyo
Diagnostic planning in JT-60 project, 3:45902 (JAERI-M—7220)
FIR-interferometer for JT-60, 3:45901 (JAERI-M—7121)
Influence of error fields on the plasma confining field and the plasma confinement in tokamak, 3:46096 (JAERI-M—7103)
JFT-2 tokamak neutral injector and preliminary results of additional heating experiment, 3:46102 (JAERI-M—7043)
Repair/maintenance design for tokamak fusion power reactor, 3:46126 (JAERI-M—7198)
Simulation of drive characteristics of JT-60 movable limiter, 3:46125 (JAERI-M—7130)
Three-dimensional analysis of eddy current with the finite element method, 3:46095 (JAERI-M—7062)
Japan Geothermal Energy Association, Tokyo
Report of geothermal multi-purpose utilization inspection tour, 3:44571 (NP—22301)
Safety measures for geothermal power generation plant without steady monitoring system, 3:44598 (NP—22300)
Jet Propulsion Lab., Pasadena, Calif. (USA)
Coal feed system development plan, 3:44053 (TID—27900)
Compendium of critiques of JPL report SP-43-17: automotive technology status and projections project, 3:44969 (N—77-33519)
Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature, 3:44360 (N—77-33604)
Report of the terrestrial bodies science working group. Volume 2. Mercury, 3:45476 (N—77-34075)
Report of the terrestrial bodies science working group. Volume 7. The Galilean satellites, 3:45477 (N—77-34080)
Junta de Energia Nuclear, Madrid (Spain)
Alpha spectrometry of thick sources. II. Application to the study of radioactive equilibria in uranium ores, 3:45128 (JEN—393)
Experimental device for the X-ray energetic distribution measurement in a tokamak plasma, 3:45903 (JEN—390)

K

Kaernbraenslesaekerhet, Stockholm (Sweden)
Deformation of a jointed rock mass, 3:44297 (ORNL-tr—4567)
Kaiser Engineers, Oakland, Calif. (USA)
Technical and economic feasibility of surface mining coal deposits, North Slope of Alaska. Final report, 3:44098 (PB—274373)
Kaiserslautern Univ. (Germany, F.R.). Fachbereich Chemie
Contact electrification of dielectric solids, 3:45085 (AED-Conf—1977-197-009)
Karlsruhe Univ. (TH) (Germany, F.R.)
Problems of geothermics using the Rhinegraben as an example, 3:44575 (NP—22841)
Kemakta Konsult AB (Sweden)
Geosphere model: description, opinions, and input requirements, 3:45359 (BNWL-tr—268)
Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research
Clean coal combustion through coal washing and blending, 3:44126 (PB—274406)
Financing public expenditures for energy-impacted roads, 3:44125 (PB—274405)
Kentucky energy resource utilization program. Semiannual report, 1 January—30 June 1977, 3:44863 (PB—274408)
Kernforschungszentrum Karlsruhe (Germany, F.R.)
Design of an accurate calculation method for the settling of radioactive substances from the exhaust of nuclear plants due to precipitation, 3:45319 (ORNL-tr—4543)
Kernforschungszentrum Karlsruhe (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik
SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles, 3:44696 (KFK—2483)
Kernforschungszentrum Karlsruhe (Germany, F.R.). Projekt Schneller Brueter
SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles, 3:44696 (KFK—2483)
Kernforschungszentrum Karlsruhe (Germany, F.R.). Projekt Spaltstoffflusskontrolle
Annual report of the Nuclear Safeguards Project 1976, 3:44307 (KFK—2465)
Kernkraftwerk RWE-Bayernwerk G.m.b.H., Gundremmingen;Guenzburg (Germany, F.R.)
Gundremmingen (KRB) nuclear power plant. Annual report 1975, 3:44641 (EUR—5651)
Koeln Univ. (Germany, F.R.). Energiewirtschaftliches Inst.
Progress report for the period January 1—June 30, 1977, 3:44856 (NP—23264)
Kungliga Tekniska Hoegskolan, Stockholm (Sweden). Institutionen foer Plasmafysik
Electric field topology near the dayside magnetopause, 3:45486 (N—77-33737)

L

Litton Systems, Inc., Morris Plains, N.J. (USA). Airtron Div.
Manufacturing methods and technology engineering for neodymium-doped YAG laser rods. Quarterly progress report No. 2, 1 June—31 August 1977, 3:45160 (AD-A—048662)
Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif. (USA)
Phase 2, automated array assembly, Task IV, Low Cost Silicon Solar Array Project. Quarterly report No. 1, November 1, 1977—January 28, 1978, 3:44358 (DOE/JPL/954898—1)
Lockheed Palo Alto Research Labs., Calif. (USA)
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June—31 August 1977, 3:45053 (FE—2299-15)
Long Beach, City of, Calif. (USA)
Improved secondary oil recovery by controlled water flooding-pilot demonstration, Ranger Zone, Fault Block VII, Wilmington Field: Phase I. Quarterly report, October—December 1977, 3:44152 (SAN—1396-15)
Los Alamos Scientific Lab., N.Mex. (USA)
Breakup of an accelerated shell owing to Rayleigh—Taylor instability, 3:45832 (LA—7291-MS)
Cargo response to railcar impact and tiedown load analysis, 3:45152 (LA-UR—78-1210)
Damage resistance of coated optics for pulsed CO_2 lasers, 3:45166 (LA-UR—78-931)
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA—7263-MS)
Explosively produced fracture of oil shale. Progress report, April—June 1977, 3:44200 (LA—6901-PR)
Feasibility of nondestructive assay measurements in uranium enrichment plants, 3:44308 (LA—7212-MS)
Geostatistics Project of the National Uranium Resource Evaluation Program. Progress report, January—March 1978, 3:44216 (LA—7296-PR)
High-temperature CO_2/O_2—coal reaction rate experiments, 3:44050 (LA—7277-MS)
Investigation of the microdosimetric characteristics of broad, therapeutic beams of negative pions at LAMPF, 3:45396 (LA-UR—78-1205)

Radio emission from quasars and BL Lac objects by coherent plasma oscillation and stimulated Compton scattering, 3:45450 (LA-UR—78-1199)
RBEOER: a FORTRAN program for the computation of RBEs, OERs, survival ratios, and the effects of fractionation using the theory of dual radiation action, 3:45395 (LA—7196-MS)
Respirator studies for the DOE Division of Operational and Environmental Safety. Progress report, October 1, 1976—September 30, 1977, 3:45147 (LA—6969-PR)
Review of criteria for nuclear criticality safety control in transportation, 3:44273 (CONF-780506—22)
Sorption—desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA—7216-MS)
Structural design for a 10-GWh SMES vacuum vessel, 3:44834 (LA-UR—77-2754)
Summary of Syllac results, 3:46082 (LA—7125-MS)
Thermochemical processes for hydrogen production. Progress report, August 1, 1977—February 28, 1978, 3:44327 (LA—7234-PR)
Transport and reactor theory. Progress report, January 1—March 31, 1978, 3:44734 (LA—7271-PR)
Uranium hydrogeochemical and stream sediment reconnaissance data release for the New Mexico portions of the Douglas, Silver City, Clifton, and Saint Johns NTMS quadrangles, New Mexico/Arizona, 3:44215 (LA—7180-MS)

Louisville Univ., Ky. (USA). Dept. of Biology
Fate and effects of oil pollutants in extremely cold marine environments. Annual report No. 5, 1 January—31 December 1977, 3:45326 (AD-A—048334)

M

Maine Yankee Atomic Power Co., Westboro, Mass. (USA)
Maine Yankee Atomic Power Plant. IE circular No. 78-06: potential common mode flooding of ECCS equipment rooms at BWR facilities, 3:44715 (DOCKET-50309—855)

Maryland Univ., College Park (USA). Dept. of Chemical Engineering
Radiation-induced crosslinking of polyethylene in the presence of bifunctional vinyl monomers, 3:45127 (ORO—2845-T1)

Massachusetts Inst. of Tech., Cambridge (USA)
Fuel—Coolant Thermal Interaction Project. Progress report No. 8, 3:44799 (COO—2781-14)

Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering
Collection and evaluation of salt mixing data with the real time data acquisition system, 3:44689 (COO—2245-36TR)

Massachusetts Inst. of Tech., Cambridge (USA). Measurement Systems Lab.
Studies of orbital Eotvos experiments. Final report, 3:45468 (N—77-33226)

Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Efficient high energy infrared third harmonic generation in gases and liquids for laser fusion applications. Annual progress report, 1 March 1977—28 February 1978, 3:45165 (COO—4251-6)
Tunable laser spectral survey of molecular air pollutants. Final report, 3:45302 (PB—276188)

Massachusetts Office of Coastal Zone Management, Boston (USA)
Massachusetts coastal zone management program. Volume I, 3:45325 (PB—274031)

McGraw-Edison Co., Canonsburg, Pa. (USA). Power Systems Div.
Surge behavior of UD cable systems. Final report, 3:44632 (EPRI-EL—720)

Mexican Bureau of Power, Mexicali
Geothermal field of Cerro Prieto on the San Jacinto Fault and its possible extension towards the Imperial Fault, 3:44573 (UCRL-Trans—1547)

Miami Univ., Coral Gables, Fla. (USA). Clean Energy Research Inst.
Solar cooling and heating: a national forum. Proceedings of condensed papers, 3:44402 (CONF-761220—)

Michigan Univ., Ann Arbor (USA). Dept. of Mechanical Engineering
Improved ultrasonic nondestructive testing of pressure vessels. Progress report, October 1, 1976—September 30, 1977, 3:45223 (NUREG/CR—0135)

Michigan Univ., Ann Arbor (USA). Highway Safety Research Inst.
Feasibility of investigating the mechanisms of aortic trauma using high-speed cineradiography. A pilot study. Final report, 15 May—31 August 1977, 3:45386 (PB—275632)

Minnesota Energy Agency, St. Paul (USA)
Energy emergency conservation and allocation plan, 3:44872 (PB—274492)

Minnesota Univ., Minneapolis (USA)
Analysis of the ductile-brittle transition temperature in Fe-binary alloys. Final report, May 1974—July 1977, 3:45015 (TID—28431)

Minnesota Univ., Minneapolis (USA). Dept. of Chemical Engineering and Materials Science
High order finite element method for the calculation of capillary surfaces, 3:45866 (LBL—7291)

Mississippi Univ., University (USA). Dept. of Chemical Engineering
Mass transport characteristics of zeolite cracking catalysts. Quarterly report, September 30—December 31, 1977, 3:44068 (FE—2727-1)

Missouri Univ., Columbia (USA)
Homemade nuclear bomb syndrome, 3:44316

Mitre Corp., McLean, Va. (USA). METREK Div.
Analysis of fuel conservation through aircraft towing. Technical report, 3:44951 (PB—274586)
Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB—274107)
System for projecting the utilization of renewable resources. SPURR methodology, 3:44348 (ERHQ/2322—77/4)

Mitsubishi Electric Corp., Amagasaki, Hyogo (Japan). Central Research Lab.
6250 kVA superconducting generator, 3:45140 (NP—23197)

Mitsubishi Metal Corp., Tokyo (Japan)
Record of drilling of Hachimandaira Onuma well 0-3(R)a, 3:44591 (NP—22302)

Mobil Tyco Solar Energy Corp., Waltham, Mass. (USA)
Large area silicon sheet by EFG. Fourth quarterly report, October 1, 1977—December 31, 1977, 3:44356 (DOE/JPL/954355—4)

Mound Facility, Miamisburg, Ohio (USA)
Annual environmental monitoring report: calender year 1977, 3:45316 (MLM—2515)
Volume reduction system for solid and liquid TRU waste from the nuclear fuel cycle: January—March 1978, 3:44281 (MLM—2517)

N

Nagoya Univ. (Japan). Inst. of Plasma Physics
Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system, 3:46040 (N—77-34003)
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves, 3:45874 (N—77-33983)
Contribution of higher order terms in the reductive perturbation theory. 2. A case of strongly dispersive wave, 3:46039 (N—77-33992)
Diffusion of a multi-ion species plasma due to drift wave fluctuations, 3:45946 (N—77-33984)
Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma, 3:45947 (N—77-33986)
End loss reduction in linear devices by means of oscillating multiple mirrors, 3:45872 (IPPJ—285)
End pluggings of a linear theta pinch by hot high z plasmas of high mass number, 3:45873 (N—77-33979)
Equilibrium of REB-ring with soft-core, 3:45945 (N—77-33978)
Experimental study on self-modulation of ion plasma oscillations, 3:45551 (N—77-33995)
Helically symmetric equilibrium of current-carrying finite beta plasma, 3:45948 (N—77-33987)
Measurements of dispersion relation of waves in a turbulently heated plasma by microwave scattering method, 3:46035 (IPPJ—291)
Microinstabilities in a plasma slab with steep density gradient, 3:45991 (N—77-34002)

New lens system using toroidal magnetic field for intense ion beams, 3:46107 (N—77-33981)
Nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma, 3:46033 (IPPJ—268)
Nonlinear electrostatic ion cyclotron waves in an rf-plugged inhomogeneous plasma slab, 3:45550 (N—77-33990)
Nonlinear heat and particle transport due to collisional drift waves, 3:45950 (N—77-33996)
Nonlinear propagation of the ordinary mode in a hot magnetoplasma, 3:46037 (N—77-33982)
Nonlinear self-modulation of ion-acoustic waves, 3:46034 (IPPJ—289)
Parametric decay of lower hybrid wave into drift waves, 3:46038 (N—77-33988)
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system, 3:45875 (N—77-34004)
Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves, 3:46041 (N—77-34005)
Real-space quasilinear theory of drift in a sheared magnetic field, 3:45949 (N—77-33994)
Rotational transform angle of the stellarator field with twisted coils, 3:46097 (N—77-34016)
Saturation of kink instability and helical equilibrium of current carrying plasma column, 3:45990 (N—77-33993)
Study on rf voltage breakdown for LHRH in 0.8 to 0.9 GHz, 3:45934 (N—77-33998)
Theory for space-time evolution of explosive-type instability, 3:45989 (N—77-33991)
Theory of two-fluid equilibrium of an axially symmetric plasma, 3:45951 (N—77-33997)
Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma, 3:46036 (N—77-33980)

National Aeronautics and Space Administration, Cleveland, Ohio (USA). Lewis Research Center
Alternative approaches to plasma confinement, 3:46083 (N—77-34000)
Usable electricity from the Sun, 3:44361 (N—77-81939)
Weibull characterization for tensile fracture of multicomponent brittle fibers, 3:45067 (N—77-33929)
X-ray photoelectron spectroscopy study of radiofrequency-sputtered titanium carbide, molybdenum carbide, and titanium boride coatings and their friction properties, 3:45066 (N—77-33348)

National Aeronautics and Space Administration, Greenbelt, Md. (USA). Goddard Space Flight Center
Heliocentric distance dependence of the interplanetary magnetic field, 3:45475 (N—77-34068)
Interplanetary medium data book, 3:45473 (N—77-34065)
Interplanetary medium data book, appendix, 3:45474 (N—77-34066)
Photometric study of the Orion OB 1 association. 3: subgroup analyses, 3:45439 (N—77-34062)
Sources of magnetic fields in recurrent interplanetary streams, 3:45478 (N—77-34091)
X-ray emitting galaxy Can-A, 3:45451 (N—77-34092)

National Aeronautics and Space Administration, Houston, Tex. (USA). Lyndon B. Johnson Space Center
Preliminary design study of a baseline MIUS, 3:44939 (N—77-34050)
Solar power satellite. Concept evaluation. Activities report. Volume 2. Detailed report. Progress report, July 1976—June 1977, 3:44392 (N—77-33600)

National Aeronautics and Space Administration, Langley Station, Va. (USA). Langley Research Center
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N—77-34018)

National Association of Conservation Districts, Washington, D.C. (USA)
Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report, 3:44860 (PB—274411)

National Bureau of Standards, Boulder, Colo. (USA)
A comparison of mathematical models for the prediction of LNG (liquefied natural gas) densities, 3:44198 (PB—276047)

National Bureau of Standards, Washington, D.C. (USA)
Estimating the energy conservation potential of ventilation control through weather data analysis. Final report, 3:44946 (PB—273949)

National Bureau of Standards, Washington, D.C. (USA). Electricity Div.
Prototype field calibration system for coupling capacitor voltage transformers (CCVTs). Final report, 3:44631 (EPRI-EL—690)

National Bureau of Standards, Washington, D.C. (USA). Inst. for Materials Research
Materials research for clean utilization of coal. Quarterly progress report, July—September 1977, 3:44049 (FE—3800-13)

National Coal Board, Burton-on-Trent (UK). Mining Research and Development Establishment
Chainless haulage systems for power loaders. Information circular as of April 1978, 3:44094 (FE—SFMP-1(78))

National Economic Research Associates, New York (USA)
Electric Utility Rate Design Study: how to quantify marginal costs, Topic 4 results for Tennessee Valley Authority, 3:44890 (NP—22554)
Electric Utility Rate Design Study: how to quantify marginal costs, a reply to Task Force 4 comments, 3:44891 (NP—22555)
Electric Utility Rate Design Study: making the transition from unit marginal costs to rates. Results for Portland General Electric Company, 3:44892 (NP—22556)
Electric Utility Rate Design Study: technology for utilizing off-peak energy, Topic 8, 3:44889 (NP—22552)

National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. (USA)
Solar—geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977—August 1977, 3:45452 (PB—275858)

National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Marine Ecosystems Analysis Program Office
Recommendations for microbiological studies in the Continental Shelf Areas. Results from two workshops convened 10—11 August 1976 and 19—20 October 1976 in Boulder, Colorado. Outer Continental Shelf environmental assessment program. Technical memo, 3:44143 (PB—274660)

National Research Council, Washington, D.C. (USA). Assembly of Life Sciences
Review of the use of ionizing radiation for the treatment of benign diseases. Volume I. Committee's report. Final report, 3:45380 (PB—274032)

National Technical Information Service, Springfield, Va. (USA)
Biological effects of laser radiation (a bibliography with abstracts). Report for 1964—January 1978, 3:45397 (NTIS/PS—78/0036)
Coal mine waste (a bibliography with abstracts). Report for 1964—January 1978, 3:44086 (NTIS/PS—78/0052)
Medical information systems (a bibliography with abstracts). Report for February 1964—December 1977, 3:45385 (NTIS/PS—78/0031)
Seafarer: impacts and studies of the extremely low frequency communication system (a bibliography with abstracts). Report for 1964—January 1978, 3:45425 (NTIS/PS—78/0062)
Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970—1977, 3:44328 (NTIS/PS—78/0054)
The chemistry of silicone resins (a bibliography with abstracts). Report for 1964—January 1978, 3:45126 (NTIS/PS—78/0050)
Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964—1977, 3:44253 (NTIS/PS—78/0048)
Uranium mining and milling environmental studies (citations from the Engineering Index data base). Report for 1970—1977, 3:44254 (NTIS/PS—78/0049)
Water pollution analysis and detection. Volume 3. 1977—January 1978 (a bibliography with abstracts). Report for 1977—January 1978, 3:45331 (NTIS/PS—78/0040)
Water pollution analysis and detection. Volume 2. July 1974—December 1976 (a bibliography with abstracts). Report for July 1974—December 1976, 3:45330 (NTIS/PS—78/0039)

Naval Research Lab., Washington, D.C. (USA)
Intense focussed ion beams and their interaction with matter. Interim report, 3:45933 (AD-A—048753)
Morphological studies of rising equatorial Spread F bubbles. Interim report, 3:45482 (AD-A—048752)
Reflex tetrode with unidirectional ion flow. Interim report, 3:45500 (AD-A—048751)

The 1976 NRL air quality data. Final report, 3:45289 (AD-A—048750)

New England Univ., Armidale (Australia). Dept. of Physics
Tables of ionospheric electron contant hourly values for Armidale, Australia for the period May 1970 through June 1975. Final report, 1 July 1973—30 July 1975, 3:45480 (AD-A—047287)

New Mexico Univ., Albuquerque (USA). Dept. of Physics and Astronomy
Demonstration salt gradient solar pond. First biannual progress report to the U.S. DOE, 3:44498 (TID—28168)

New York State Government, Albany (USA)
Design definition of a mechanical capacitor. Final report, June 1976—April 1977, 3:44838 (N—77-33603)

New York Univ., N.Y. (USA). Courant Mathematics and Computing Lab.
Configurable software for satellite graphics, 3:46136 (COO—3077-148)

North Carolina Central Univ., Durham (USA)
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL—13832)

North Carolina Dept. of Commerce, Raleigh (USA). Energy Div.
Energy consumption in North Carolina, 1975 and 1976, 3:44916 (PB—274075)

North Carolina Dept. of Natural Resources and Community Development, Raleigh (USA). Div. of Earth Resources
Geology of the Raleigh 1° x 2° Quadrangle, North Carolina, 3:44212 (GJBX—51(78))

North Carolina State Univ., Raleigh (USA). Center for Marine and Coastal Studies
Continental margin atmospheric climatology and sea level (Historical setting 1974—1975), 3:45436 (SRO—902-8)

North Carolina Univ., Chapel Hill (USA)
Studies of nuclear processes. Progress report, 1 January 1977—31 December 1977, 3:45680 (ORO—2408-124)

Notre Dame Univ., Ind. (USA)
Minimum entropy production principle and Ostwald ripening, 3:45831 (COO—4385-1)

Nuclear Regulatory Commission, Washington, D.C. (USA)
Investigations of the adequacy of the meteorological transport model developed for the reactor safety study, 3:44811 (SAND—78-0574C)
Power Reactor Docket Information, 3:44713 (NUREG/PRDI—78/6)

Nuclear Regulatory Commission, Washington, D.C. (USA). Office of Inspection and Enforcement
Revised inspection program for nuclear power plants, 3:44710 (NUREG—0397)

Nuclear Regulatory Commission, Washington, D.C. (USA). Office of Management Information and Program Control
Report to Congress on abnormal occurrences, October—December 1977, 3:45427 (NUREG—0090-10)

Nuclear Regulatory Commission, Washington, D.C. (USA). Office of Nuclear Reactor Regulation
Antitrust review of nuclear power plants. Recent developments, 3:44711 (NUREG—0447)

Nuclear Regulatory Commission, Washington, D.C. (USA). Office of the Executive Legal Director
United States Nuclear Regulatory Commission Staff Practice and Procedure Digest. Supplement 3 to Digest No. 1, 3:44709 (NUREG—0386(Suppl.3))

Nuclear Water and Waste Technology, San Jose, Calif. (USA)
Effects of hydrogen peroxide additions on shutdown chemistry transients at pressurized water reactors. Final report, 3:44647 (EPRI-NP—692)

NUS Corp., Rockville, Md. (USA). Energy Systems Div.
Foreign uranium supply. Final report, 3:44276 (EPRI-EA—725)

O

Oak Ridge Associated Universities, Inc., Tenn. (USA). University Programs Office
Educational programs and facilities in nuclear science and engineering, 3:45133 (TID—28375)

Oak Ridge Gaseous Diffusion Plant, Tenn. (USA)
Procedures manual for groundwater reconnaissance sampling, 3:44214 (K/UR—12)

Oak Ridge National Lab., Tenn. (USA)
Design study for a 24-cm HTGR microsphere coating furnace, 3:44261 (ORNL/TM—6321)
Electron microscopy: a tool for visualizing chromatin, 3:45369 (CONF-780445—1)
Evaluation of models used for the assessment of radionuclide releases to the environment. Progress report, April 1976—December 1977, 3:45317 (ORNL—5382)
Evaluation of the General Atomic codes TAP and RECA for HTGR accident analyses, 3:44809 (ORNL/NUREG/TM—178)
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL—5387)
Important hydrodynamic and spectroscopic techniques in the field of chromatin structure, 3:45370 (CONF-780445—2)
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM—84)
Measurements of the average number of prompt neutrons emitted per fission of ^{239}Pu and ^{235}U, 3:45773 (ORNL/TM—6246)
Monitoring of prestressed concrete pressure vessels. 1. An overview of concrete embedment strain instrumentation and calibration test results for selected concrete embedment strain meters, 3:44761 (ORNL/TM—6191/V1)
Multilevel crossing rates for automated signal classification, 3:44732 (CONF-780403—3)
Performance testing of single electrically heated fuel pin simulators for PWR LOCA experiments, 3:44808 (ORNL/NUREG—35)
Progress on sol-gel sphere-pac development, 3:44259 (CONF-780535—1)
Review and combination of experimental results for neutron emission per fission of ^{232}Th, 3:45772 (ORNL/TM—6245)
Review of criteria for nuclear criticality safety control in transportation, 3:44273 (CONF-780506—22)
Thermal effects on aquatic organisms: an annotated bibliography of the 1976 literature, 3:45406 (ORNL/EIS—124)
Thermal ratchetting tests of Type 304 stainless steel pipe: specimens TTT-1 and TTT-2, 3:45013 (ORNL—5386)
Volume reduction of low-level contaminated metal waste by melting: selection of method and conceptual plan, 3:44282 (ORNL/TM—6388)

Oak Ridge Y-12 Plant, Tenn. (USA)
Cargo-Restraint-Transporter (CRT): a novel approach to the handling of cargo on DOE's Safe-Secure Trailers (SST), 3:44274 (Y/OA—2034)

Occidental Oil Shale, Inc., Grand Junction, Colo. (USA)
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976—October 31, 1977. Volume I, 3:44204 (TID—28053/1)
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976—October 31, 1977. Volume II, 3:44205 (TID—28053/2)

Oregon State Univ., Corvallis (USA)
Relationships between removal processes and residence times for atmospheric pollutants, 3:45290 (CONF-780611—3)

P

Pacific Technology, Del Mar, Calif. (USA)
Leakage effects on LMFBR cell liners, 3:44813 (SAND—78-0742C)

Panametrics, Inc., Waltham, Mass. (USA)
Total ozone derived from uv spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights. Final report, 3:45479 (N—77-33684)

PEDCO-Environmental, Inc., Cincinnati, Ohio (USA)
Inspection manual for the enforcement of new source performance standards: coal preparation plants. Final report, 3:44124 (PB—274262)

Pennsylvania State Univ., University Park (USA). Environmental Acoustics Lab.
Evaluation of experimental and developmental communication systems used in underground coal mines. Performance of trapped-miner communication system. Final report, 1 April 1976—31 January 1977, 3:44100 (PB—274683)
Pennsylvania Univ., Philadelphia (USA)
Background information for the economic assessment of solvent fermentation processes, 3:44387 (COO—4070-4)
Pennzoil Co., Vienna, W.Va. (USA)
Oil recovery by carbon dioxide injection. Quarterly report, October—December 1976, 3:44151 (ORO—5301-7)
Pfefferle (William C.), Consultant, Middletown, N.J. (USA)
Catalytic combustion: a look back, a look forward, 3:45230 (CONF-771015—17)
Pittsburgh Univ., Pa. (USA). Dept. of Civil Engineering
Preliminary evaluation of the biological oxidation of thiocyanates. Progress report, November 30, 1977—February 28, 1978, 3:44085 (COO—4502-2)
Pope, Evans and Robbins, Inc., New York (USA)
Multicell fluidized-bed boiler design, construction, and test program. Monthly progress report No. 66, 3:44614 (FE—1237-T-7)
Princeton Univ., N.J. (USA). Plasma Physics Lab.
Lower limits for parallel impurity fluxes in the PLT edge plasma, 3:45905 (PPPL—1440)
Rapid scanning of spatial distribution of spectral line intensities in PLT tokamak, 3:45935 (PPPL—1430)
Purdue Univ., Lafayette, Ind. (USA)
High pressure steam pipe, 3:44617 (PB—274758)
Purdue Univ., Lafayette, Ind. (USA). Agricultural Experiment Station
Developing an energy input-output simulator (AGNRG) for analysis of alternative cropping systems in the Corn Belt (energy in agriculture), 3:44855 (PB—274094)
Energy-cased analysis of alternative production methods and cropping systems in the Corn belt, 3:44853 (PB—273896)

R

RAND Corp., Santa Monica, Calif. (USA)
Nuclear reactor spent fuel valuation: procedure, applications, and analysis, 3:44725 (R—2239-DOE)
R and D Associates, Marina del Rey, Calif. (USA)
Evaluation of geothermal energy exploration and resource assessment. Final report. Volume II. Two phase flow in the geothermal wellbore, 3:44599 (SAN—1269-1(Vol.2))
Research Triangle Inst., Research Triangle Park, N.C. (USA)
Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB—266103)
Resource Planning Associates, Inc., Cambridge, Mass. (USA)
Economics and utilization of thorium in nuclear reactors, 3:44724 (ORNL/TM—6331)
Resources for the Future, Inc., Washington, D.C. (USA)
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB—273847)
Reynolds Electrical and Engineering Co., Inc., Mercury, Nev. (USA)
Assessment of the Nevada Test Site for low-level waste management, 3:44291 (NVO—193)
Rochester Univ., N.Y. (USA)
Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer, 3:45375 (UR—3490-1379)
Rockwell International Corp., Canoga Park, Calif. (USA). Rocketdyne Div.
Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification, 3:44046 (FE—2518-14)
Rogers Engineering Co., Inc., San Francisco, Calif. (USA)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP—23013)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex E. Geohydrology, 3:44576 (NP—23011)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex A. Geology, 3:44577 (NP—23014)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex C. Electric resistivity, 3:44581 (NP—23012)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex F. Heat flow, 3:44582 (NP—23015)
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP—22850)

S

Sandia Labs., Albuquerque, N.Mex. (USA)
Analysis of alternative transportation methods for radioactive materials shipments including the use of special trains for spent fuel and wastes, 3:44272 (CONF-780506—9)
Codes for Dijkstra's shortest path algorithm, 3:46139 (SAND—78-0493)
DEEP STEAM: Project 16 enhanced oil recovery. Quarterly report, October 1—December 31, 1977, 3:44153 (SAND—78-0313)
Description, operation, and diagnostic routines for the adaptive intrusion data system, 3:44310 (SAND—77-1029)
Evaluation methodology based on physical security assessment results: a utility theory approach, 3:44313 (SAND—78-0377)
Fault tree analysis for vital area identification, 3:44312 (SAND—78-0364C)
Fossil Energy Development Programs. Quarterly report, October 1—December 31, 1977, 3:44052 (SAND—78-0653)
Geothermal well technology: drilling and completions program plan, 3:44596 (SAND—77-1630)
Instrumentation and process control development for in situ coal gasification. Twelfth quarterly report, September—November 1977, 3:44051 (SAND—78-0253)
Intrusion-detection via adaptive prediction, 3:44311 (SAND—77-1591)
Investigations of the adequacy of the meteorological transport model developed for the reactor safety study, 3:44811 (SAND—78-0574C)
LCL: a compiler and language for logical mask checking, 3:45229 (SAND—77-2031)
Leakage effects on LMFBR cell liners, 3:44813 (SAND—78-0742C)
Light water reactor safety research program. Quarterly report, July—September 1977, 3:44810 (SAND—78-0076)
Numerical modeling of unsteady flame propagation, 3:45130 (SAND—77-8275)
Parametric evaluation of heat transfer and coolant options for breeder reactor spent fuel shipping casks designs, 3:45153 (SAND—77-1415C)
Physics analysis of an SFT fuel pin experiment in the ACPR, 3:44784 (SAND—77-1737)
Solar powered irrigation: present status and future outlook, 3:44468 (SAND—78-0016C)
Storage reduction for Runge-Kutta codes, 3:46140 (SAND—78-0909)
Systematic approach to the conceptual design of physical protection systems for nuclear facilities, 3:44306 (HCP/D0789—01)
Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples, 3:44812 (SAND—78-0718)
Sandia Labs., Livermore, Calif. (USA)
Mechanical properties of sulfamate nickel electrodeposits, 3:45014 (SAND—77-8042)
Rates and mechanisms of pulverized coal combustion. First annual report, 3:44136 (SAND—78-8234)
Thermochemical Energy Storage and Transport Program. Semiannual report, April 1977—September 1977, 3:44847 (SAND—77-8056)
Variable-displacement spark-ignition engine. Final report, 3:44973 (SAND—77-8299)
San Joaquin County, Stockton, Calif. (USA)
Economic adjustment strategy study for San Joaquin County, California, 3:44963 (PB—274556)
Scattergood School, West Branch, Iowa (USA)
Solar heating system for recreation building at Scattergood School, 3:44440 (DOE/NASA/CR—150553)

Science Applications, Inc., La Jolla, Calif. (USA)
Energy efficiency program for room air conditioners, central air conditioners, dehumidifiers, and heat pumps, 3:44926 (SAI—77-858-LJ)
Project development and technical development plan. New York Bight Project, 3:45358 (PB—276014)
Science Applications, Inc., McLean, Va. (USA)
Tactical implications of air blast variations from nuclear tests. Final report, 15 April—30 November 1976, 3:45286 (AD-A—048802)
Scott Paper Co., Chester, Pa. (USA)
Overview of the M.A.I.T. analysis system (machine analysis of the internal threat), 3:44314 (UCRL—81005)
Selskapet for Industriell og Teknisk Forskning, Trondheim (Norway). Div. of Structural Engineering
Gassim. user's description: a gas reservoir simulation model, 3:44192 (N—77-33467)
Shaker Research Corp., Ballston Lake, N.Y. (USA)
Underground coal mine instrumentation and test. Final report, 3:44095 (N—77-33479)
Societa Italiana Applicazioni Geofisiche, Milan (Italy)
Seismic research in the Larderello area: first results, 3:44580 (NP—22785)
Soil Conservation Service, Washington, D.C. (USA)
Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report, 3:44860 (PB—274411)
SRI International, Menlo Park, Calif. (USA)
Measurement of rate constants of importance in smog. Final report, April 1973—July 1977, 3:45298 (PB—274530)
Stadtspital Waid and Triemli, Zurich (Switzerland). Klinik fuer Nuklearmedizin und Radiotherapie
Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr—77-72)
Stanford Univ., Calif. (USA). Center for Materials Research
Solid electrolyte battery materials. Final report, 1 July 1976—31 September 1977, 3:44851 (AD-A—048330)
Stanford Univ., Calif. (USA). High-Energy Physics Lab.
Feasibility analysis of gravitational experiments in space. Final report, 3:45467 (N—77-33223)
State Univ. of New York, Buffalo (USA)
SUNYAB/EPRI Combined Injection ECC Program. Interim report, 3:44802 (EPRI-NP—757)
Stone and Webster Engineering Corp., Boston, Mass. (USA)
Conceptual design for an atmospheric fluidized-bed direct combustion power generating plant. Phase I. Commercial plant conceptual design. Annual report, January 14, 1977—January 31, 1978, 3:44608 (FE—2583-13)
Strasbourg-1 Univ., - 67 (France). Geology Inst.
Geological follow-up of the mining of the natural reactors of Oklo, 3:44210 (LA-tr—78-26)
Suntech, Inc., Marcus Hook, Pa. (USA). Research and Engineering Div.
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976—April 1977 and quarterly technical progress report No. 4, February 1977—April 1977, 3:44064 (FE—2306-12)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7—July 31, 1976, 3:44069 (TID—28163)
Suntech, Inc., Richardson, Tex. (USA)
Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume I. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report, 3:44201 (PB—274435)
Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume II, Parts 1 and 2. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report, 3:44202 (PB—274520)

T

Technion-Israel Inst. of Tech., Haifa
Macroscopic description of laser-type matter. Final technical report (3rd year), August 1976—August 1977, 3:45851 (AD-A—048442)
Technische Univ. Berlin (Germany, F.R.)
Theoretical and experimental investigations on shock waves in gas-solid flows, 3:44903 (N—77-33468)
Technische Univ. Berlin (Germany, F.R.). Inst. fuer Hochspannungstechnik und Starkstromanlagen
380 kV cable in Berlin, 3:44630 (AED-Conf—76-407-006)
Technische Univ. Muenchen (Germany, F.R.). Lehrstuhl und Lab. fuer Energiewirtschaft und Kraftwerkstechnik
Impact of the technological change on energy technology, 3:44606 (AED-Conf—76-399-002)
Tennessee State Planning Office, Knoxville (USA). East Tenn. Section
Phipps Bend Nuclear Energy Project. Community impact assessment. Final report, 3:44645 (PB—274370)
Tennessee Univ., Knoxville (USA). Dept. of Electrical Engineering
Multilevel crossing rates for automated signal classification, 3:44732 (CONF-780403—3)
Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences
Electron microscopy: a tool for visualizing chromatin, 3:45369 (CONF-780445—1)
Important hydrodynamic and spectroscopic techniques in the field of chromatin structure, 3:45370 (CONF-780445—2)
UKAEA Research Group, Harwell. Atomic Energy Research Establishment
Plutonium redistribution in mixed-oxide (U,Pu)O_2 nuclear fuel elements, 3:44772 (AERE-TP—714)

U

Union Carbide Corp., Oak Ridge, Tenn. (USA). Nuclear Div.
Procedures manual for groundwater reconnaissance sampling, 3:44214 (K/UR—12)
United Nuclear Industries, Inc., Richland, Wash. (USA)
Fuel storage basin: criticality safety analysis report and technical basis, 3:44789 (DUN-NUSAR—7824)
Technical criteria and bases: pressurized water-cooled, graphite moderated production reactor, 3:44791 (HW—53612(Rev.2))
United Technologies Corp., South Windsor, Conn. (USA). Power Systems Div.
Parameter monitoring for corrosion control of utility gas turbines. Interim report, 3:44613 (EPRI-AF—665)
United Technologies Corp., Windsor Locks, Conn. (USA). Hamilton Standard Div.
Dirt feedlot residue experiments. Quarterly progress report, October 1, 1977—November 30, 1977, 3:44386 (COO—2952-16)
United Technologies Research Center, East Hartford, Conn. (USA)
Far-infrared inspection of cable insulation. Interim report, 3:44633 (EPRI-EL—738)
Universidad Nacional de Cordoba (Argentina). Departamento de Ciencias Geologicas
Active volcanoes and their relation to geothermal energy, 3:44569 (NP—22160)
Utah Univ., Salt Lake City (USA). Dept. of Materials Science and Engineering
Impurity effects on the creep of polycrystalline magnesium and aluminum oxides at elevated temperatures. Technical progress report, December 19, 1976—December 18, 1977, 3:45065 (COO—1591-32)

V

Valtion Teknillinen Tutkimuskeskus, Helsinki (Finland)
Influence of tightening of the windows on the condensation and the heat economy, 3:44927 (UCRL-Trans—1548)

Vast Research Co., Beila Vista, Ark. (USA)
Design of a quiet rock drill. A feasibility study using principles of leavell pavement breaker. Final report, 3:44099 (PB—274402)
Versar, Inc., Springfield, Va. (USA)
Alternatives for hazardous waste management in the inorganic chemicals industry. Final report, September 1976—January 1977, 3:45362 (PB—274565)
Virginia Univ., Charlottesville (USA)
Gas—solids interactions in the distribution zone of a fluidized bed: Phase I. Quarterly report, May 1—July 31, 1977, 3:44133 (FE—2451-5)

W

Webb Inst. of Naval Architecture, Glen Cove, N.Y. (USA)
Maritime fuel conservation, 3:44953 (PB—275722)
Westinghouse Electric Corp., Churchillboro, Pa. (USA). Mechanical Research and Development Div.
Automatic surface flaw inspection of nuclear fuel pellets, 3:44260 (HEDL-SA—1409)
Westinghouse Electric Corp., Madison, Pa. (USA). Advanced Reactors Div.
Radial blanket design and development quarterly progress report for period ending November 30, 1977, 3:44699 (WARD-RB—3045-22)
Westinghouse Electric Corp., Oak Ridge, Tenn. (USA). Advanced Reactors Div.
Role and progress of the Clinch River Breeder Reactor Plant, 3:44688 (CONF-780440—1)
Westinghouse Electric Corp., Pittsburgh, Pa. (USA)
Failure Modes and Effects Analysis (FMEA) of the Residual Heat Removal System, 3:44650 (WCAP—8967)
PWR FLECHT skewed profile low flooding rate test series evaluation report, 3:44819 (WCAP—9183)
Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Advanced Energy Systems Div.
Investigation of separation-lubrication substances for use in isothermal forging. Final report, 16 December 1974—1 July 1976, 3:45002 (AD-A—048588)
Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Advanced Systems Technology Div.
Frequency domain analysis of low-frequency oscillations in large electric power systems. Interim report. Applications of a small-scale computer program, 3:44628 (EPRI-EL—726)
Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Fusion Power Systems Dept.
Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub—7117/25)
TNS engineering trade study analysis, 3:46084 (ORNL/Sub—7117/24)
Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Large Rotating Apparatus Div.
Superconducting generator design. Final report, 3:45139 (EPRI-EL—577)
Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Research and Development Center
Light-fired thyristor development. Interim report, 3:44629 (EPRI-EL—776)
Westinghouse Electric Corp., Trafford, Pa. (USA). Power Circuit Breaker Div.
Low Cost Silicon Solar Array Project, Silicon Materials Task. Development of a process for high capacity arc heater production of silicon for solar arrays. Quarterly technical report, July—September 1977, 3:44357 (DOE/JPL/954589—3)
Westinghouse Nuclear Energy Systems, Pittsburgh, Pa. (USA)
N-16 Transit Time Flow Measurement System (TTFM) description and performance, 3:44651 (WCAP—9264)
Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering
Growth of molten core debris pools in concrete. Progress report, March 1, 1977—November 30, 1977, 3:44800 (COO—4261-4)
Worcester Polytechnic Inst., Mass. (USA). Higgins Lab.
Study of Zircaloy-4: steam oxidation reaction kinetics. Final report, 3:44801 (EPRI-NP—734(Pt.2))
Wyoming Univ., Laramie (USA). Dept. of Electrical Engineering
Remote electromagnetic sensing of underground coal burns. Quarterly technical report, September—November 1977. Interim annual report, 3:44043 (FE—2414-6)

Z

Zurich Univ. (Switzerland)
Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr—77-73B)

AUTHOR INDEX

Authors' surnames are indexed in the form appearing in the abstracted publication; given names are reduced to initials. Each author entry gives the publication title and the citation number. Report numbers, if applicable, are given in parentheses at the end of the entry. For publications with multiple authors, an author entry is provided for each. Entries for the second and succeeding authors give references to the first author.

Because of problems involved in the mechanical preparation of this index, all accent marks are omitted. Changes in spelling introduced as a result of accent omission follow standard conventions.

A

Aamodt, P.L., *See* Sharp, R.R. Jr., 3:44215
Abagjan, A.A., Neutron quasialbedos from plane reflectors, 3:45824
Secondary gamma radiation study in reactor shielding, 3:44769
Abbey, D., *See* Harrington, W., 3:44090
Abbott, L.F., Determination of the weak neutral-current couplings, 3:45616
Local supersymmetry transformations and fermion solutions in the presence of instantons, 3:45667
Abdel-Khalik, S.I., Growth of molten core debris pools in concrete. Progress report, March 1, 1977—November 30, 1977, 3:44800 (COO—4261-4)
Abe, H., Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system, 3:45875 (N—77-34004)
See Fukumasa, O., 3:46040
Abel'skii, S.S., *See* Irkhin, Y.P., 3:45033
Abel, B.D., TFTR vacuum system, 3:46130
Abraimov, V.V., *See* Startsev, V.I., 3:45019
Abramov, V.V., Temperature dependence of plastic deformation rate in lead at the superconducting transition, 3:45018
Abrams, E.F., Alternatives for hazardous waste management in the inorganic chemicals industry. Final report, September 1976—January 1977, 3:45362 (PB—274565)
Abrams, G.S., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Acena Barrenechea, M.L., Alpha spectrometry of thick sources. II. Application to the study of radioactive equilibria in uranium ores, 3:45128 (JEN—393)
Achenbach, J.D., *See* Petroski, H.J., 3:44686
Achtziger, J., Effects of heat leaks on thermal insulation of domestic and industrial buildings, 3:44943
Ackermann, F.H., Electrically induced waste air combustion. Applications and advantages of the new process, 3:45241
Ackermann, H., Effects of gamma radiation on gallium-arsenide lasers. Master's thesis, 3:45156 (AD-A—048361)
Acres, G.J.K., Platinum catalysts for exhaust emission control: the mechanism of catalyst poisoning by lead and phosphorus compounds, 3:44985
Adamenko, I.N., Wave propagation in fluids with a nonlinear friction—velocity relationship (in the example of He II), 3:45553
Adamowicz, R.F., *See* Hercher, M., 3:45181
Adams, C.E. Jr., Effects and removal of heavy metals in biological treatment, 3:45352
Adams, N.J.I., Nuclear installation inspectorate presentation, 3:44742 (IAEA—18; CONF-751268—, pp 259-261)
Adams, r.C., Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume I. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report, 3:44201 (PB—274435)
Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume II, Parts 1 and 2. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report, 3:44202 (PB—274520)
Addabbo, C., *See* Chon, W.Y., 3:44802
Adler, S.L., Classical algebraic chromodynamics, 3:45656
Afanas'ev, G.N., Separation of the fusion channel in heavy-ion reactions, 3:45802
Afanas'ev, N.G., *See* Kuplennikov, E.L., 3:45709
See Nemashkalo, A.A., 3:45735
See Polishchuk, V.N., 3:45736
Aglitskii, E.V., Observation of x-ray spectra of chromium and iron in the plasma of the "tokamak-10", 3:45916
Agron, P.A., *See* Carlson, T.A., 3:45271
Ahern, T.P., *See* Keizer, P.D., 3:44177
Ahlstrom, H.G., Laser fusion experiments at 2 TW, 3:46114
See Boyle, M.J., 3:45253
See Storm, E.K., 3:46118
Ahmad, I., Proton states in the Z = 99 nucleus ^{251}Es excited by ^{251}Fm electron capture decay and ^{250}Cf(α,t) reaction, 3:45767
Ahmadi, G., Irreversibility of electrostatic plasma turbulence, 3:45979
Ahmed, N., Intrusion-detection via adaptive prediction, 3:44311 (SAND—77-1591)
Ahnert, C., *See* Velarde, G., 3:44736
Aiman, W.R., Hoe Creek II field experiment on underground coal gasification, preliminary results, 3:44056 (UCRL—80592)
Ainscough, T.L., Solar energy for the hotel/motel industry, 3:44414 (CONF-761220—, pp 147-148)
Ajzenberg-Selove, F., States of ^{122}In and ^{124}In, 3:45742
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
Akaishi, K., Application of torsion vacuum microbalance to sputtering yield measurement, 3:46133
Akaiski, J., *See* Shirotani, T., 3:45403
Akhababyan, N.O., *See* Angelov, N., 3:45588
Akhiezer, A.I., Theory of electron trapping by plasma waves, 3:46024
Akiba, M., *See* Sugawara, T., 3:46102
Akopyan, A.V., Bremsstrahlung of relativistic electrons in a plasma in a strong magnetic field, 3:46079
Akopyan, G.G., *See* Alfimenkov, V.P., 3:45690
Al-Shaieb, Uranium potential of sedimentary and igneous rocks in western and southwestern Oklahoma, 3:44229 (USGS-CIRC—753, pp 61-62)
Alam, M.S., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Alanakyan, Y.R., Self-localized electromagnetic fields in a dense gas, 3:45894
Alavi, A., *See* Kuhl, D.E., 3:45388, 3:45392
Albee, A.L., Report of the terrestrial bodies science working group. Volume 2. Mercury, 3:45476 (N—77-34075)
Albright, C.H., Implications of the Y (9.5) for gauge theories of weak interactions, 3:45620
Albright, N., Small-amplitude periodic sloshing modes of a liquid in a vertical right circular cylinder with a concave spheroidal bottom, 3:45549 (LBL—7204)
Alburger, D.E., Core excited T = 2 levels in A = 12 from studies of ^{12}Be, 3:45698
Alcock, A.J., *See* Corkum, P.B., 3:45214
Alcorn, W.R., *See* Berry, D.A., 3:44066
Aleksakhin, I.S., Electronic spectra of autoionization states of barium, observed in electron-atom collisions, 3:45541

Excitation of autoionization states of LiI in electron—atom collisions, 3:45539
Investigation of the Ba emission spectra in the 50—90-nm region with electron impact excitation of atoms, 3:45540
Aleksandrov, Y.A., *See* Mihu, R., 3:45744
Alexander, B.M., Volume reduction system for solid and liquid TRU waste from the nuclear fuel cycle: January—March 1978, 3:44281 (MLM—2517)
Alexander, C.K., *See* Latif, F.A., 3:44435
See Lazor, J.M., 3:44493
See Macala, G.A., 3:44456
See Passella, J.R., 3:44434
Alexander, J.E., Method for measurement of relative differences in thermal expansion coefficients (LWBR development program), 3:44698 (WAPD-TM—1134)
Alexander, J.M., *See* Delagrange, H., 3:45763
See Fleury, A., 3:45764
See Miller, J.M., 3:45751
Alferov, D.F., Observation of undulating radiation with the "Pakhra" synchrotron, 3:45245
Alferov, Z.I., Low-threshold laser with In—Ga—As—P heterostructure, 3:45194
Alfimenkov, V.P., Neutron scattering lengths for ^{3}He, 3:45690
Ali, A.W., *See* Golden, J., 3:45170
Allain, A., *See* Lefort, G., 3:45151
Allen, R.W., Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC), 3:44428 (CONF-761220—, pp 295-297)
Allen, T.J., Managing the flow of technology: technology transfer and the dissemination of technological information within the R and D organization, 3:44866
Allersma, E., *See* DeGroot, A.J., 3:45343
Almeida, P.I.F., *See* Lobo, P.C., 3:44485
Alperovich, V.Ya., Temperature monitoring at the seat of fires using the ethylene—acetylene ratio, 3:44116
Alster, J., *See* Preedom, B.M., 3:45689
Alston-Garnjost, M., Differential cross section of the reaction $K^- p \rightarrow$ K-bar^{0}n from 515 to 956 MeV/c, 3:45584
Total cross section of the reaction $K^- p \rightarrow$ K-bar^{0}n from 515 to 1065 MeV/c, 3:45583
Altgeld, H., *See* Lueck, K., 3:44190
Alton, G.D., *See* Vane, C.R., 3:45534
Alvis, R.L., *See* Lukens, L.L., 3:44468
Alyea, F., *See* Cook, C.S., 3:44900
Amaglobeli, N.S., Study of the invariant structure function of the reaction $\pi^- p \rightarrow \gamma^+$ xxx at 5 GeV/c, 3:45587
Amann, J.F., *See* Zeidman, B., 3:45700
Amemiya, H., Scattering and energy broadening of an electron beam in a plasma, 3:45943
Amesz, J., *See* Coudert, C., 3:44804
Amirkhanov, I.V., Composite model of mesons in relativistic configuration space, 3:45674
Amos, J.C., Interim evaluation of Sodium—Water Reaction Test No. 1 data and comparison with TRANSWRAP analyses: Series I large leak test program, 3:44691 (GEFR—00027(L))
Amsden, A.A., Relativistic two-fluid model of nucleus-nucleus collisions, 3:45762
Amus'ya, M.Y., Bremsstrahlung in collisions of fast electrons with atoms, 3:45538
An, S., *See* Oka, Y., 3:44707
Anand, D.K., *See* Allen, R.W., 3:44428
Anbar, M., Method and apparatus for electrochemical generation of power from hydrogen, 3:44911
Anderson, A.C., *See* Katerberg, J.A., 3:45096
Anderson, A.L., *See* Campbell, G.W., 3:45381
Anderson, C.A., *See* Bennett, J.G., 3:44834
Anderson, D.E., Comparative electrical generation costs, 3:44717 (CONF-760688—, pp 12-30)
Anderson, E.M., Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976—June 1977, 3:44041 (FE—2218-11)
Anderson, F.R., Design of a quiet rock drill. A feasibility study using principles of leavell pavement breaker. Final report, 3:44099 (PB—274402)
Anderson, H. Jr., Discussion of a planar, Fresnel reflector, rotatable facet concentrator, 3:44491 (CONF-761220—, pp 223-224)
Anderson, J.W., Physiological stresses and response in chronically oiled organisms, 3:45417
Recruitment of benthic animals as a function of petroleum hydrocarbon concentrations in the sediment, 3:45106
Anderson, L.W., *See* Hennies, D., 3:45502
Anderson, R.A., *See* Kepler, R.G., 3:45080
Anderson, R.T., Current status and future considerations for a transportation system for spent fuel and radioactive waste, 3:44275 (Y/OWI/SUB—77/42513)
Andreev, A.A., Threshold for the absolute instability of stimulated Brillouin scattering in a plasma with density and temperature gradients, 3:46072
Andreev, N.E., Hydrodynamic Cerenkov instability of inhomogeneous plasma streams, 3:46016
Saturation of the parametric instability in a strong electromagnetic field, 3:46025
Andreev, S.S., Investigation of small earthquakes in Southwestern Turkmenia, 3:45430 (UCRL-Trans—11363)
Method of isosurfaces in the interpretation of local earthquakes, 3:45431 (UCRL-Trans—11364)
Andreeva, M.N., Ionizational instabilities of an externally sustained discharge in air, 3:46019
Andrejko, D.A., Solarized office: architectural implications in office planning and design, utilizing direct solar gain by means of 'solar modulators', 'transparent insulation', and 'solar storage tiles', 3:44403 (CONF-761220—, pp 5-8)
Andrews, K.J., *See* Corkum, P.B., 3:45214
Angelov, N., Transverse momentum correlations of identical pions from 40-GeV/c π^- p interactions, 3:45588
Two-particle correlations of charged particles and photons in pion-nucleon interactions at 40 GeV/c, 3:45589
Anisimov, S.I., *See* Inogamov, N.A., 3:45963
Anon, Semi-inclusive π^- N reactions at 40 GeV/c, 3:45591
Anstaugh, B.E., *See* Berman, P.A., 3:44360
Antal, M.J. Jr., Method and equipment for producing synthetic fuel from wastes, 3:44336
Anthony, A.J., Holddown device for nuclear fuel assembly, 3:44653
Antipov, Y.M., Production of J/Psi particles by 43-GeV/c π^- mesons on the nuclei Be, Cu, and W, 3:45586
Antonov, S.V., *See* Baksht, F.G., 3:45926, 3:45927
Anzelon, G.A., *See* Chapman, T.C., 3:45777
Aono, O., *See* Sakai, K., 3:45947
Appel, J.A., *See* Fisk, R.J., 3:45575
Appelquist, T., Static limit of quantum chromodynamics, 3:45670
Applin, K., *See* Langmuir, D., 3:44228
Aprelev, M.V., *See* Mihu, R., 3:45744
Aragones, J.M., *See* Velarde, G., 3:44736
Arakawa, Y., *See* Sugawara, T., 3:46102
Arbuzov, B.A., Structure of elementary particles and relationships between the different forces of nature, 3:45597
Arganbright, V.E., *See* Odell, B.N., 3:45281
Arima, A., Core-polarization and exchange-current effects on the magnetic form factor of ^{17}O, 3:45693
Aristov, A.V., Spatial coherence of the emission of a rhodamine-6G water-solution laser in an unstable cavity with lamp pumping, 3:45198
Armistead, R.A., Laser damage phenomenology in materials, 3:46120
Arnas, O.A., Solar-powered dehumidification, 3:44424 (CONF-761220—, pp 269-270)
Arnold, R.G., Elastic electron scattering from ^{3}He and ^{4}He at high momentum transfer, 3:45687
Arora, D., Theoretical method for solving a two-level collision system, 3:45530
Arsenin, V.V., Possible feedback suppression of the tearing-mode instability in a tokamak, 3:45897
Artemov, K.P., Alpha-cluster structure of the ^{20}Ne nucleus at excitation energies above 30 MeV, 3:45713
Arushanov, G.G., Corrections to the solution of the unitarity relation, 3:45630
Asano, N., *See* Nishihara, K., 3:45899
Asaturyan, V.M., Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV, 3:45563
Asay, J.R., Self-consistent technique for estimating the dynamic yield strength of a shock-loaded material, 3:45017
Asbridge, J.R., *See* Feldman, W.C., 3:45456
See Gosling, J.T., 3:45457
Asell, B., *See* Jerneloev, A., 3:45353
Ashton, J.L., *See* Arnas, O.A., 3:44424
Asmus, K., *See* Gregor, K., 3:44025
Ataguenduez, G., Utilization of solar energy for cooling and drying systems, 3:44467 (CONF-761220—, pp 365-384)
Atanasov, A.A., Application of the method of formal series to the problem of many-channel potential scattering, 3:45678
Atkinson, C.H., Western gas sands project. Status report, 3:44196 (NVO—0655-105)
Atlas, R.M., Fate and effects of oil pollutants in extremely cold marine environments. Annual report No. 5, 1 January—31 December 1977, 3:45326 (AD-A—048334)
Prudhoe crude oil in Arctic marine ice, water, and sediment ecosystems: degradation and interactions with microbial and benthic communities, 3:44176
Aubert, G., Device for thermal insulation of a prestressed concrete vessel which affords resistance to the pressure of a vaporizable fluid contained in said vessel, 3:44646
Auble, R.L., Nuclear data sheets for A=46, 3:45723
Aurich, D., Influence of the stress state on the fracture toughness, 3:44744 (IAEA—18; CONF-751268—, pp 211-216)
Aver'yanov, K.S., *See* Bratashevskii, Y.A., 3:45097

Avery, W.F., Method for the separation of high-boiling hydrocarbons in normal paraffins and branch-chain hydrocarbons on molecular sieves, 3:44167
Axe, J.D., *See* Emery, V.J., 3:45081
Aykan, K., *See* Mannion, W.A., 3:44982
Ayres, D.S., *See* Kramer, S.L., 3:45577
Azaryan, M.O., Particles emitted backward in the lab in hadron-nucleus interactions at > or ≈1 TeV, 3:45579
Azhari, N., Solar MSF sea water desalination plant, 3:44354

B

Baader, W., Prospects of biogasproduction from agricultural organic residues, 3:44333
Babaritskii, A.I., Beam—plasma discharge in crossed electric and magnetic fields, 3:45983
Babcock, J., Quantum-chromodynamic spin-spin asymmetries in large-P/sub T/ hadron production with polarized beam and target, 3:45629
Babkin, G.V., *See* Gupalo, M.S., 3:45036
Babonneau, D., *See* Bourdier, A., 3:46052
Bachrach, R.Z., Interface states at the Ga—GaAs interface, 3:45083
Backovic, S., *See* Angelov, N., 3:45589
Bagaev, S.A., Transfer excitation energy between n=5 levels in He I, 3:45515
Bahcall, J.N., Proposed solar-neutrino experiment using ^{7}1Ga, 3:45453
Bahel, V.O., Heat pump assisted solar powered absorption system, 3:44445
Baker, D.R., Dual laser interferometer for plasma density measurements on large tokamaks, 3:45910
Baker, L.E., *See* Newsom, M.M., 3:44596
Baker, M.P., *See* Burman, R.L., 3:45697
Bakhshiev, N.G., *See* Smirnov, V.S., 3:45192
Baksht, F.G., Probe diagnostics of a low-temperature plasma in a magnetic field. I. Experimental procedure and determination of the plasma density, 3:45926
Probe diagnostics of a low-temperature plasma in a magnetic field. II. Determination of the electron temperature and the plasma potential, 3:45927
Bakumenko, O.D., BN-350 reactor shielding studies, 3:44700
Balabanova, L.A., Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
Balachandran, A.P., Gribov ambiguities in the U gauge, 3:45672
Balamuth, D.P., *See* Alburger, D.E., 3:45698
Balazs, L.A.P., Adler zero and the dual multiperipheral model, 3:45631
Baldis, H.A., *See* Richardson, M.C., 3:45930
Baldwin, G.C., Kinetics of stimulated emission in neutron-pumped nuclear laser systems, 3:45218
On the feasibility of grasers, 3:45217
Ball, J.W., *See* Miller, J.M., 3:45751
Ball, S.J., Evaluation of the General Atomic codes TAP and RECA for HTGR accident analyses, 3:44809 (ORNL/NUREG/TM—178)
Ballam, J., *See* Chadwick, G.B., 3:45585
Balon, J.E., *See* Markarian, R.K., 3:44966
Baltenkov, A.S., *See* Amus'ya, M.Y., 3:45538
Baltrusch, H., Solar energy utilization in multivalent heating systems, 3:44451
Baluni, V., Instantons and the hypothetical light boson, 3:45661
Non-Abelian gauge theories of Fermi systems: Quantum-chromodynamic theory of highly condensed matter, 3:45441
Bame, S.J., *See* Feldman, W.C., 3:45456
See Gosling, J.T., 3:45457
Bamford, W.H., Effects of reactor vessel fatigue loading cycles on crack growth, 3:44745 (IAEA—18; CONF-751268—, pp 227-241)
Bammert, K., Gas turbine cycles for effective use of solar energy, 3:44396
Bandmann, H., Perspective of the energy policy for Europe: demands and recommendations concerning energy and research policy for overcoming the present stagnation, 3:44884
Banegas, A., Fast Poisson solvers for problems with sparsity, 3:46144
Banerjee, M.K., Theory of the low-energy pion-nucleon interaction, 3:45797
Banet, J., Solar radiation collector, 3:44515
Banks, C.E., *See* Adams, r.C., 3:44201, 3:44202
Baranov, D.S., Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber, 3:45571
Baranov, N.N., *See* Kovbasyuk, V.I., 3:44901
Barashenkov, V.S., Interactions of high-energy particles and atomic nuclei with nuclei (chapter 7 thru 11), 3:45798 (AD-A—048311)
Barbaro-Galtieri, A., *See* Jaros, J.A., 3:45561
Barber, R.E., Performance tests of an improved three ton air conditioner for the Honeywell Mobile Solar Research Facility, 3:44421 (CONF-761220—, pp 245-252)
Barbero, P., Post irradiation examination of the fuel discharged from the Trino Vercellese reactor after the 2nd irradiation cycle, 3:44648 (EUR—5605)
Barbucci, P., Exponential supplementary equations for S/sub N/ methods: the two-dimensional case, 3:44740
Bardakov, V.M., Evolution of slightly localized Alfven quasimodes in a two-component tokamak, 3:46059
Barger, H.E., Solar heater, 3:44547
Barish, B.C., Experimental mean y values and intergrated structure functions for neutrino and antineutrino scattering at high energy, 3:45566
See Merritt, F.S., 3:45569
Barker, J.R., Measurement of rate constants of importance in smog. Final report, April 1973—July 1977, 3:45298 (PB—274530)
Barnes, G.J., Comparison of platinum and base metal oxidation catalysts, 3:44991
Barnes, N.P., Distributed aperture effect in laser rods with negative lenses, 3:45179
Barnett, J.H., *See* Newsom, M.M., 3:44596
Barnett, R.M., Origins of neutrino events with three muons, 3:45617
See Abbott, L.F., 3:45616
Baron, G., Process for production of gas rich in methane which can be exchanged for natural gas, 3:44335
Barr, S.M., Calculating the electron mass in terms of measured quantities, 3:45596
Barron, J.M., *See* Rapp, F. Jr., 3:44539
Barrows, R.G., Weibull characterization for tensile fracture of multicomponent brittle fibers, 3:45067 (N—77-33929)
Bartenbach, C., *See* Daniels, K., 3:44930
Barthel, F., Uranium prospecting in the Federal Republic of Germany, 3:44252
Barthelmess, W., *See* Fry, H., 3:44397
Bartholomew, C.H., Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20—December 20, 1977, 3:44048 (FE—2729-1)
Bartholomew, R.J., Cargo response to railcar impact and tiedown load analysis, 3:45152 (LA-UR—78-1210)
Bartlett, J.F., *See* Barish, B.C., 3:45566
See Merritt, F.S., 3:45569
Bartley, W.E., *See* Rule, A.O., 3:44941
Barton, G.W. Jr., *See* Stephens, F.B., 3:45303
Baryshnikov, A.G., Microscopic K-matrix approach to the continuous spectrum in the four-nucleon problem, 3:45787
Baryshnikov, F.F., Classical and quantum treatment of the Stark broadening of hydrogen lines, 3:45518
Barzakh, A.E., *See* Neronov, Y.I., 3:45517
Bashmakov, Y.A., *See* Alferov, D.F., 3:45245
Basov, N.G., Powerful 12-channel laser installation "DELFIN" for spherical heating of thermonuclear targets, 3:46124
Bass, R.B., *See* Johnson, W.R., 3:44831
Basson, J.K., *See* De Jesus, A.S.M., 3:44255
Bastasz, R., Auger study of surface carbon and oxygen on thorium following ion bombardment, 3:45031
Batchelder, D.A., *See* Alexander, B.M., 3:44281
Bathgate, M.B., *See* Stone, R.G., 3:44195, 3:44816, 3:45132, 3:45135, 3:45284
Batishche, S.A., Organic-dye attachment for converting the wavelength of the radiation of pulsed solid-state and gas lasers, 3:45193
Batist, L.K., Isotopic dependence of the yield of ^{1}7N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
Batkin, I.S., Effect of a laser field on the probability for muon capture in light nuclei, 3:45519
Battat, M.E., Shielding standards: a case history, 3:45825
Battiste, R.L., *See* Corum, J.M., 3:45013
Bauer, S.H., *See* Wolga, G.J., 3:45159
Bauer, T.S., *See* Hoffman, G.W., 3:45702
Bauerschmidt, R., Energy forecasts with special concern of renewable energy sources, 3:44882
Baum, J.W., *See* Varma, M.N., 3:45827
Bayless, J.H., Method and device for the thermal insulation of a deep well, 3:44157
Baz, A.I., Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material, 3:45808 (ORNL-tr—4653)
Bazant, E., Brittleness. Presupposition (criteria) for reactor vessel brittle fracture, 3:44746 (IAEA—18; CONF-751268—, pp 385-405)
Baznat, M.I., Translational invariance effects in octupole excitations of deformed nuclei, 3:45694
Beach, C.D., Solar cooling, Florida welcome station, 3:44423 (CONF-761220—, pp 267-268)
Bean, J.W., *See* Kusuda, T., 3:44946
Bean, R.M., *See* Anderson, J.W., 3:45106
Beard, J.N. Jr., *See* Hester, J.C., 3:44457
Bebek, C.J., Electroproduction of single pions at low ϵ and a measurement of the pion form factor up to $Q^2 = 10$ GeV^2, 3:45562

Bechthold, W., Calculation of potential danger of stored wastes, 3:44304 (ORNL-tr—4598)
Beck, J.K., *See* Evans, R.D., 3:44439
Becker, E.R., *See* Wei, J., 3:44993
Becker, E.W., Physics of uranium-235-enrichment in the separation nozzle process. IV. Separation nozzle with double flow deflection and triple stream splitting, 3:44257
Becker, G., Modelling of MHD equilibria of the Garching Belt Pinches by a cylindrical slab, 3:45958
Becker, M., *See* Parvez, A., 3:45823
Becker, R.H., *See* Mushotzky, R.F., 3:45451
Beckerman, M., Statistical-model analyses of heavy-ion-induced fusion reaction products, 3:45738
Beckman, J.C., *See* Fanale, F.P., 3:45477
Beckmann, K., Coordination of strip mining and completion of longwall working, 3:44101
Bedford, S., *See* Green, A.C., 3:44948
Begeal, D.R., Hydrogen and deuterium permeation in copper alloys, copper—gold brazing alloys, gold, and the in situ growth of stable oxide permeation barriers, 3:45027
Behannon, K.W., Heliocentric distance dependence of the interplanetary magnetic field, 3:45475 (N—77-34068)
See Burlaga, L.F., 3:45478
Behr, F., *See* Schulten, R., 3:44331
Behrens, J.W., Measurements of the neutron-induced fission cross sections of ^{240}Pu, ^{242}Pu, and ^{244}Pu relative to ^{235}U from 0.1 to 30 MeV, 3:45775
Beier, E., *See* Weisberg, H., 3:45582
Bel'chenko, Y.I., Escape of cesium from a surface-plasma H^--ion source, 3:45504
Belichenko, A.G., *See* Elenskii, F.Z., 3:44027
Belikov, V.S., Turbulent diffusion in a multicomponent plasma, 3:45976
Belkov, B.M., *See* Larikov, L.N., 3:45034
Bell, J., Diffractive production of vector mesons in high-energy neutrino interactions, 3:45567
Bell, P.M., *See* Mao, H.K., 3:45270
Belovintsev, K.A., *See* Alferov, D.F., 3:45245
Belovskii, M.N., Direction pattern of the microwave radio flares of the Sun, 3:45464
Belt, B.D., *See* Holland, R.E., 3:45731
Bement, T.R., Geostatistics Project of the National Uranium Resource Evaluation Program. Progress report, January—March 1978, 3:44216 (LA—7296-PR)
Bender, C.F., Theoretical absorption spectra of ArKr, 3:45545
Bender, D.J., Measurement of vibrational population distributions in a supersonic expansion of carbon monoxide, 3:45508
Bender, M., *See* Culver, R.H., 3:45386
Bennett, C.J., Solar panel, 3:44503
Bennett, H.A., Evaluation methodology based on physical security assessment results: a utility theory approach, 3:44313 (SAND—78-0377)
Bennett, J.G., Structural design for a 10-GWh SMES vacuum vessel, 3:44834 (LA-UR—77-2754)
Bennett, K., *See* de Vellis, J., 3:45371
Bennett, N., *See* Ferris, C.S.., 3:44232
Bennett, R.A., *See* Ombrellaro, P.A., 3:44780
Bennington, G., *See* Rebibo, K., 3:44348
Bennon, R.J., *See* Byerly, R.T., 3:44628
Benson, L.V., *See* Leach, D.L., 3:44233
Benson, S.W., *See* Barker, J.R., 3:45298
Bentsen, J., *See* Rasmussen, K.N., 3:44949
Benvenuti, A., *See* Wanderer, P., 3:45570
Berdnikov, Y.A., Proton knockout from light nuclei by 170-MeV π^+ mesons, 3:45710
Berendsen, P., *See* Dooley, J.R. Jr., 3:44249
Berezhnev, S.F., Model-independent analysis of the inverse electroproduction of pions at 276 MeV, 3:45696
Berg, R., Measurement of the distribution of ^{129}I in and its discharge from the Karlsruhe Reprocessing Plant, 3:44303 (BNWL-tr—311)
Berg, R.S., Structure and morphology of chemical-sprayed CdS films, 3:44373
Berge, J.P., *See* Bell, J., 3:45567
Berger, E.L., Implications of nucleon-nucleon spin-polarization measurements, 3:45636
Bergeron, K.D., *See* Shope, S., 3:45248
Berk, J.V., Design of a mobile laboratory for ventilation studies and indoor air pollution monitoring, 3:44938 (LBL—7817)
Berkenkamp, K., *See* Volk, A., 3:44197
Berkovitch, I., Coal on the switchback: the coal industry since nationalisation, 3:44886
Berlovich, E.E., *See* Batist, L.K., 3:45580
Berman, P.A., Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature, 3:44360 (N—77-33604)
Bernardi, A., Seismic research in the Larderello area: first results, 3:44580 (NP—22785)
Berndorfer, K., *See* Fry, H., 3:44397
Bernstein, I.B., Effects of high-frequency fields on plasma transport coefficients, 3:45954
Berry, D.A., Catalyst development program for hydrodesulfurization and liquefaction of coal to produce clean boiler fuels. Monthly report, April 1978, 3:44066 (FE—2321-31)
Berry, J.P., Efficiency of coalface equipment, 3:44106
Bers, A., *See* Sen, A., 3:46048
Bertin, P.Y., *See* Preedom, B.M., 3:45689
Bertini, H.W., High energy ($E < or = 1000$ GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data, 3:45641
Bertino, J.P., *See* Wagner, P., 3:44050
Bertrand, F.E., *See* Malbrough, D.J., 3:45708
Beslu, P., Analysis of dose rates near the circuit of a PWR after shutdown, 3:44655
Prediction of primary circuit contamination in power reactors, 3:44654
Bespalov, P.A., Interaction of fast electrons with hydromagnetic waves at a bounce resonance, 3:46022
Quasilinear relaxation of a beam interacting with an isotropic plasma, 3:45977
Bessler, W., Computer simulation and system optimization of a solar powered absorption cooling process, 3:44430 (CONF-761220—, pp 305-307)
Bessonov, E.G., *See* Alferov, D.F., 3:45245
Bette, J.A., Solar heating system, 3:44443
Bezaz'yan, A.V., Seam extraction conditions in the Western Donbass classified according to the hydrogeological factors, 3:44115
Bezuglyi, E.V., Voltage jumps in the current—voltage characteristics of superconductive channels, 3:45048
Bezzubov, V.A., *See* Antipov, Y.M., 3:45586
Bhandari, R., Forbidden decays psi' → eta + psi and psi' → π^0 + psi, 3:45651
Bhat, M.S., *See* Perkins, R.A., 3:45053
Bhattacharyya, S.K., Comparative safety physics parameters in the advanced fuels critical assemblies, 3:44786 (ZPR-TM—312)
Bhatti, R.A., Nuclear reactor fuel management, 3:44682
Bialowons, W., *See* Hensel, W., 3:44840
Bianconi, A., *See* Bachrach, R.Z., 3:45083
Biberman, L.M., Development of ionization instability in plasma with a variable direction of the mean current, 3:46021
Bibler, N.E., Effect of internal alpha radiation on borosilicate glass containing Savannah River Plant waste, 3:44290 (DP—1482)
Bichevina, V.N., Crustal thickness in the island region of the Soviet Far East, 3:45428 (UCRL-Trans—11367)
Bidoglio, G., *See* Barbero, P., 3:44648
Biederman, R.R., Study of Zircaloy-4: steam oxidation reaction kinetics. Final report, 3:44801 (EPRI-NP—734(Pt.2))
Bien, F., Measurements of nitric oxide ion vibrational absorption coefficient and vibrational transfer to N_2, 3:45481 (AD-A—048628)
Bier, W., *See* Becker, E.W., 3:44257
Bierenbaum, H.S., *See* Miller, G.L., 3:44462
Bierhals, R., Big firms, too, back solar energy. Successful meeting of the Arbeitsgemeinschaft Solarenergie, 3:44452
Bierman, S.R., Critical separation between subcritical clusters of 4.29 wt % ^{235}U enriched UO_2 rods in water with fixed neutron poisons, 3:45149 (NUREG/CR—0073)
See Durst, B.M., 3:45150
Biermann, A., *See* Mohrmann, H., 3:45239
Bilen'kii, S.M., Lepton mixing and neutrino oscillations, 3:45622
Possible suppression of P-odd effects in heavy atoms, 3:45516
Bingham, C.R., *See* Guidry, M.W., 3:45748
Binkert, H., Profession of the 'solar crafter', 3:44344
Binkley, J.S., GAUSSIAN 76: an ab initio molecular orbital program, 3:45544 (BNL—24136)
Birkelund, J.R., Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
Birrer, S.A., Pilot-plant development of a Rover waste calcination flowsheet, 3:44280 (ICP—1148)
Biryhkov, Yu.V., Chromatographic investigations of the components of the liquid nonvolatile constituents of the plastic mass of coal, 3:44077
Bischel, W.K., *See* Flicker, H., 3:45180
See Kligler, D., 3:45173
Bishop, E.C., Radial blanket design and development quarterly progress report for period ending November 30, 1977, 3:44699 (WARD-RB—3045-22)
Bisnovatyi-Kogan, G.S., Models of the outflowing envelopes of T Tau stars, 3:45448
Bizard, G., *See* Wozniak, G.J., 3:45760
Bjerknes, C.A., *See* Van't Hof, J., 3:45372
Bjork, C.W., *See* Riley, P.J., 3:45704
Black, S., Deep cutting continuous miner. (effect of drum rotational speed and depth of cut on airborne respirable dust and specific energy). Final report, January 1972—December 1976, 3:44097 (PB—274345)
Blair, W., *See* Iverson, W.P., 3:45347
Blair, W.R., *See* Brinckman, F.E., 3:45350
Blake, J.B., *See* Paulikas, G.A., 3:45485

Blann, M., Comments on alternate formulations for preequilibrium decay, 3:45795
See Beckerman, M., 3:45738
See Plasil, F., 3:45746
Blanpied, G.S., *See* Hoffman, G.W., 3:45702
Blattmann, H., Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr—77-73B)
Bleach, R.D., Plasma x-ray emission produced by ruby lasers at 10^{12} W/cm^2, 3:45908
Blecher, M., *See* Preedom, B.M., 3:45689
Blenski, T., Higher order prompt-jump approximation in reactor kinetics, 3:44735
Blewitt, T.H., *See* Brown, B.S., 3:45057
Bley, P., *See* Becker, E.W., 3:44257
Bliss, E., *See* Trenholme, J., 3:46123
Bloch, F., *See* Wiswall, R., 3:45122
Blokhintsev, L.D., *See* Baryshnikov, A.G., 3:45787
Blokhintseva, T.D., *See* Berezhnev, S.F., 3:45696
Blond, R.M., *See* Sprung, J.L., 3:44811
Bloom, A.M., *See* Yuan, S.W., 3:44561
Blue, R.A., *See* Weller, H.R., 3:45727
Bobleter, O., Apparatuses for the dissolution of resistent nuclear fuel for analytical sample preparation, 3:44265 (AIAU—77503)
Bobrov, M.S., Parameters of the solar wind responsible for plasma injection into the region of the magnetospheric ring current, 3:45463
Bobykin, B.V., Energy properties of radioactive electron emission from tantalum, 3:45038
Bochenin, V.I., Reduction in the error of determining the ash content of coal by the radioisotope method, 3:44081
Bockhold, G. Jr., Performance measurement system for training simulators. Interim report, 3:44773 (EPRI-NP—783)
Bodek, A., *See* Barish, B.C., 3:45566
See Merritt, F.S., 3:45569
Boehm, F., *See* Wang, K., 3:45511
Boenig, F., Parameter monitoring for corrosion control of utility gas turbines. Interim report, 3:44613 (EPRI-AF—665)
Boettiger, H., Who works with nuclear fusion technology. Demands of the technological development on the training, 3:46089
Boffi, V.C., Evaluation of the neutron flux-depression factor via the integral transform method, 3:45819
Bofinger, H., *See* Raetz, K., 3:44931
Bogachev, G.G., *See* Aleksakhin, I.S., 3:45540
Bogano, Ya.R., *See* Kanadero, U.K., 3:45084
Bogdanov, P.V., Effective fields at diamagnetic impurities in rare-earth metals, 3:45051
Bogert, D.V., *See* Bell, J., 3:45567
Bohannon, G.E., Neutron-proton bremsstrahlung results at 200 MeV, 3:45685
Bohm, A., Generalization of the electromagnetic current operator, 3:45647
Bohnstedt, W., *See* Stephan, K., 3:44076
Boice, J.R., *See* Green, A.C., 3:44948
Bol, K., *See* Grisham, L.R., 3:45937
Boldt, E.A., *See* Mushotzky, R.F., 3:45451
Bolfing, B.J., *See* Suchomel, R.R., 3:44261
Bollefer, D.L., Solar energy collector system, 3:44536
Bollinger, J.C., Control of volatile organic emissions from solvent metal cleaning, 3:45322 (PB—274557)
Bond, G.C., Proceedings of the sixth international congress on catalysis, 3:45119
Bond, M., *See* Snapp, P.C., 3:44645
Bonner, B.E., *See* Riley, P.J., 3:45704
Bonnet, J., Electron-beam-controlled gas-flow CO_2 laser, 3:45190
Book, D.L., Theoretical studies of the formation and adiabatic compression of reversed-field configurations in imploding liners, 3:46098
Bordoloi, K.C., *See* Bynum, F.A., 3:44489
Boring, M., Calculations of the electronic structure and transitions of actinide metal hexafluorides, 3:45507
Borovik, A.A., *See* Aleksakhin, I.S., 3:45539
Borovik, A.S., *See* Aleksakhin, I.S., 3:45541
Bose, S., Small-angle x-ray scattering from oriented ellipsoidal voids in pyrolytic graphite, 3:45082
Botros, M.M., Building heating energy consumption at fixed facilities. Final report, April—June 1977, 3:44947 (AD-A—048324)
Bouchez, J., *See* Chadwick, G.B., 3:45585
Boudette, E.L., Two-mica granite and uranium potential in the northern Appalachian orogen of New England, 3:44246 (USGS-CIRC—753, pp 23-24)
Boudrie, R.L., *See* Zeidman, B., 3:45700
Bourdier, A., Relativistic effects on electromagnetic wave propagation in a cold inhomogeneous electron plasma, 3:46052
Bourne, R.C., Performance of the UNLLES solar-heat pump demonstration home, 3:44413 (CONF-761220—, pp 137-145)
Bourque, L.R., *See* Campbell, F.R., 3:44770
Bouz, J.J., *See* Budinger, T.F., 3:45393
Bowen, A., Significance of hybrid solar architecture, 3:44406 (CONF-761220—, pp 17)
Boyarski, A.M., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Boyce, J.R., Measurement of elastic strain in granular material, 3:45234
Boyd, D.P., Fan beam x- or γ-ray 3-D tomography, 3:45273
Boyer, J.F., Coal and coal mine drainage, 3:44087
Boyer, K., Laser plasma interactions at 10.6 μm wavelengths, 3:46115
Boyle, J.P., *See* Cronauer, D.C., 3:44033
Boyle, M.J., Imaging characteristics of an axisymmetric, grazing incidence x-ray microscope designed for laser fusion research, 3:45253
Braatz, R.J., *See* Suchomel, R.R., 3:44261
Bracke, T.P., *See* Johnson, W.R., 3:44831
Bradbury, M.H., *See* Matsui, H., 3:45091
Bradley, F., *See* Mayo, D.W., 3:45333
Bradley, O., *See* Davis, T.O., 3:45147
Bradley, W.S., *See* Adams, r.C., 3:44201, 3:44202
Braetter, P., Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B—188)
Bragg, R.H., *See* Bose, S., 3:45082
Brainard, W.A., X-ray photoelectron spectroscopy study of radiofrequency-sputtered titanium carbide, molybdenum carbide, and titanium boride coatings and their friction properties, 3:45066 (N—77-33348)
Bramlette, T.T., Thermochemical Energy Storage and Transport Program. Semiannual report, April 1977—September 1977, 3:44847 (SAND—77-8056)
Brandenburg, R.W., *See* Cox, C.W., 3:45268
Brannick, L.L., *See* Adams, r.C., 3:44201, 3:44202
Bratashevskii, Y.A., Conduction-electron spin resonance in Hg/sub 1-x/Cd/sub x/Te solid solutions, 3:45097
Bratus', E.N., *See* Bezuglyi, E.V., 3:45048
Bratzler, K., *See* Baron, G., 3:44335
Braun, M.A., Contribution of inelastic rescattering to cumulative meson production, 3:45644
Braun, P., *See* Viehboeck, F.P., 3:44418
Brederlow, G., *See* Hohla, K., 3:45212
See Witte, K., 3:45213
Breen, G.A.M., *See* de Vellis, J., 3:45371
Breidenbach, M., *See* Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Breizman, B.N., Stationary spectra of high-frequency oscillations of a plasma in a magnetic field, 3:46077
Brenk, H.D., Design of an accurate calculation method for the settling of radioactive substances from the exhaust of nuclear plants due to precipitation, 3:45319 (ORNL-tr—4543)
Brennan, J.F., *See* Lester, G.R., 3:44989
Bresesti, M., *See* Barbero, P., 3:44648
Breuner, D.B., *See* Steinman, D.K., 3:44235
Breustedt, W., Building design with regard to energy conservation, 3:44932
Brey, F., *See* Youngquist, J., 3:44627
Briedenbach, M., *See* Jaros, J.A., 3:45561
Briggs, R.J., *See* Lauer, E.J., 3:45993
Brinckman, F.E., Mercury distribution in the Chesapeake Bay, 3:45350
See Iverson, W.P., 3:45347
Brindley, K., *See* Butler, J., 3:44706
Britt, H.C., Yet more complexity in fission: Barriers for nuclei with N = 150—154, 3:45776
See Christensen, P.R., 3:45745
See Plasil, F., 3:45746
Broda, E., Utilization of solar energy through photosynthesis and artificial water photolysis, 3:44389
Brody, H., *See* Weisberg, H., 3:45582
Bronovets, T.M., *See* Eremin, I.V., 3:44080
Brooman, E.W., *See* Schwerzel, R.E., 3:44390
Browman, A., *See* Bebek, C.J., 3:45562
Brown, B.C., *See* Fisk, R.J., 3:45575
Brown, B.S., Critical-current changes in neutron-irradiated Nb_3Sn as a function of irradiation temperature and initial metallurgy, 3:45057
Brown, C.N., *See* Bebek, C.J., 3:45562
See Fisk, R.J., 3:45575
Brown, D.J., *See* Geiger, J.F., 3:44292
Brown, D.P., Gamma compensated, self powered neutron detector, 3:45261
Brown, D.W., *See* McCain, B.B., 3:45377
Brown, H.D., Solar powered gas generation, 3:44399
Brown, K.W., *See* Barish, B.C., 3:45566
See Merritt, F.S., 3:45569
Brown, R.A., High order finite element method for the calculation of capillary surfaces, 3:45866 (LBL—7291)
Brown, S.F., *See* Boyce, J.R., 3:45234
Brown, V.R., Extension of core polarization in inelastic scattering to include charge-exchange reactions, 3:45792
Brown, W.D., *See* Sprung, J.L., 3:44811
Brown, W.R., *See* Leonard, R.P., 3:45300, 3:45301, 3:45364, 3:45365
Brown, W.T., Nature of the electric field and the resulting voltage in axially loaded ferroelectric ceramics, 3:45070
Browne, J.C., *See* Green, T.A., 3:45506
Browne, T.E., Supply 77: EPRI annual energy supply forecasts, 3:44876 (EPRI-EA—634-SR)
Brownell, G.L., *See* Ter-Pogossian, M.M., 3:45382
Brueck, S.R.J., *See* Kildal, H., 3:45165

Brueckner, K.A., Axial tomography, 3:45274
Reply by K.A. Brueckner on comments by E. Panarella on the paper 'Wavelength dependence of laser coupling to pellet implosions' by K.A. Brueckner and R.S. Janda, Nucl. Fusion 17(2) (1977) 305, 3:46110
Brunner, R., Solar energy saves annually 5000 l heating fuel oil. Water heating and additional heating in Simbach/Inn, 3:44463
Bryan, J.B., Two-dimensional computer simulation of hypervelocity impact cratering: some preliminary results for Meteor Crater, Arizona, 3:45433 (UCRL—80539)
Bryan, R.H., *See* Merkle, J.G., 3:44643
Brye, B.A., *See* Nicholas, W.R., 3:45354
Bube, R.H., *See* Tsai, M., 3:44367
Bucher, R.G., *See* Bhattacharyya, S.K., 3:44786
Buchholz, D., *See* Barish, B.C., 3:45566
See Merritt, F.S., 3:45569
Budagov, Y.A., Cross sections of strange particle production in π^- p interactions at 5 GeV/c, 3:45590
See Amaglobeli, N.S., 3:45587
Budanov, N.P., *See* Antipov, Y.M., 3:45586
Buder, M.K., Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101—9)
Budi Santoso, Preliminary study on plasma physics and its applications, 3:45952 (PPGM—R95-76)
Budinger, T.F., Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer-assisted CNS studies, 3:45393
See Derenzo, S.E., 3:45389
Budny, R., Deep-inelastic neutral-current cross sections, 3:45603
Buishvili, L.L., Establishment of equilibrium between the nuclear and electron subsystems on dynamic cooling of nuclei, 3:45681
Bulanov, S.V., Finite amplitude Langmuir oscillations in the plasma resonance region, 3:46078
Bulashev, V.M., Adsorption of vapors of organic substances on coal, 3:44078
Bullock, R.A., *See* Hopkins, G.R., 3:46127
Bulyginskii, D.G., Plasma confinement in a purely toroidal magnetic confinement system with a self-consistent electric field, 3:45898
Bulyshev, A.E., Reconstruction of the distribution function of a plasma microfield from the H/sub β/ line profile, 3:45919
Bunatyan, G.G., Moments of inertia and gyromagnetic ratios of compound states, 3:45784
Bunn, R.L., Action of aqueous alkali on pyrite, 3:44030 (IS-ICP—51)
Bunn Jr., Fluidized-bed cracking plant, 3:44165
Bunnell, K., Inelastic muon-neutron scattering: Charged-hadron multiplicities and prong cross sections, 3:45564
See del Papa, C., 3:45611
Burakov, V.S., Method for determining plasma properties from light absorption, 3:45922
Use of the method of resonance fluorescence with a dye laser for plasma diagnostics in the FT-1 tokamak installation, 3:45917
Burbaker, T.A., Development of control algorithms for chemistry systems. Final report, September 1, 1978—September 30, 1977, 3:45109 (UCRL—13826)
Burchill, R.F., Underground coal mine instrumentation and test. Final report, 3:44095 (N—77-33479)
Burgbacher, F., Open questions in energy supply, 3:44880
Burger, T.N., *See* Ramsey, W.E., 3:44274
Burgess, E.L., *See* Fossum, J.G., 3:44363
Burke, J.R., *See* Shah, Y.M., 3:44124
Burlaga, L.F., Sources of magnetic fields in recurrent interplanetary streams, 3:45478 (N—77-34091)
Burleson, G.R., *See* Zeidman, B., 3:45700
Burman, R.L., Pion double-charge exchange on ^{16}O and ^{18}O, 3:45697
See Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Burnashev, M.N., Polarization of the active medium of a multimode gas laser with excitation modulation, 3:45197
Burnett, N.H., *See* Richardson, M.C., 3:45930
Burns, J.A., *See* Green, A.C., 3:44948
Burns, K.A., *See* Krebs, C.T., 3:45414
Burrell, K.H., Fast hydrogen gas injection system for plasma physics experiments, 3:45869
Burrows, W.D., Review of the status of total mercury analysis, 3:45107
Burstall, R.F., Prediction of fission product and actinide levels in irradiated fuel and cladding, 3:44738
See Richardson, B.L., 3:44766
Burt, E.R., *See* Wilson, W.F., 3:44212
Burton, D.E., *See* Bryan, J.B., 3:45433
Busdosh, M., *See* Atlas, R.M., 3:44176
Bush, S.H., Final comments of the U.S. delegation concerning ASME code Section XI, Appendix A, 3:44747 (IAEA—18; CONF-751268—, pp 383-384)
Bushnin, Y.B., *See* Antipov, Y.M., 3:45586
Bustraan, M., *See* McKay, H.A.C., 3:44279
Busygin, A.I., Residual ionization in the expansion of a laser-produced plasma, 3:45964
Butler, D.M., Solar converter, 3:44385
Butler, G.W., *See* Westfall, G.D., 3:45707
Butler, J., UK fast reactor shield design and performance, 3:44706
Butler, J.N., Long-term fate of petroleum hydrocarbons after spills: compositional changes and microbial degradation, 3:44175
Butler, P.A., *See* Guidry, M.W., 3:45748
Butner, D.N., *See* McGoldrick, P.R., 3:46142
Bychenkov, V.Y., Generation of harmonics of the pump wave and diagnostic of parametric turbulence, 3:46017
Ultrahigh speed diagnostics of the parameters of laser plasma corona, 3:45918
Byerly, R.T., Frequency domain analysis of low-frequency oscillations in large electric power systems. Interim report. Applications of a small-scale computer program, 3:44628 (EPRI-EL—726)
Bykovskii, Y.A., Laser-produced plasma of two-component mixtures, 3:45988
Bynum, F.A., Solar collector based on an array of lineard Clipped-V channels, 3:44489 (CONF-761220—, pp 211-213)

C

Cabeza, L., *See* Blattmann, H., 3:45401
Cadigan, R.A., *See* Felmlee, J.K., 3:44223
Caglioti, E., Generation and testing of the shielding data library EURLIB for fission and fusion technology, 3:45817
Cahn, R.N., Decays of the Y′ and the structure of the resonances at 10 GeV, 3:45595
Caird, J.A., $TbCl_3$—$AlCl_3$ vapors: characteristics of a potential new high energy gas phase laser medium, 3:45162 (CONF-780202—21)
Calamand, D., Results of neutron propagation in steel sodium mixtures with various source spectra on Harmonie and Tapiro, 3:44704
Calame-Longjean, A., *See* Lefort, G., 3:45151
Caldwell, D.O., Measurements of the photon total cross section on protons from 18 to 185 GeV, 3:45560
Calhoun, J.H., Microprocessor instrumentation and control of the University of Louisville's Dual Solar Energy Research Center, 3:44437 (CONF-761220—, pp 341-342)
See Murray, T.M., 3:44412
Callan, C.G. Jr., Toward a theory of the strong interactions, 3:45666
Callen, J.D., *See* Tsang, K.T., 3:45998
Cameli, G.M., *See* Bernardi, A., 3:44580
Cammarata, J.B., *See* Banerjee, M.K., 3:45797
Campagna, A.O., *See* Pettigrew, M.J., 3:44671
Campagna, M., *See* Dietz, R.E., 3:45103
Campbell, F.R., In-reactor measurement of fuel-to-sheath heat transfer coefficients between UO_2 and stainless steel, 3:44770 (AECL—5400)
Campbell, G.W., New developments in ultrasonic imaging of the chest and other body organs, 3:45381 (UCRL—80340(Rev.1))
Campbell, J.A., Application of X-ray photoelectron spectroscopy to the study of fly ash, 3:45304
Short papers of the U.S. Geological Survey uranium—thorium symposium, 1977, 3:44217 (USGS-CIRC—753)
Campbell, K., *See* Bement, T.R., 3:44216
Campbell, L.E., *See* Leech, C.A. III, 3:44995
Campbell, P.M., Laser driven compression and neutron generation with spherical shell targets, 3:46116
Campo, A., Numerical simulation of parabolic collectors for solar heat exchangers, 3:44492 (CONF-761220—, pp 225-226)
Campos-P., V., *See* Colwell, R.R., 3:45409
Cantley, D.A., *See* Omberg, R.P., 3:44693
Cantrell, C.D., Effects of molecular rotation and vibration—rotation interaction on collisionless multiple-photon excitation of SF_6, 3:45546
Capenos, J.M., *See* Froes, F.H., 3:45008
Carabetta, R.A., *See* Linevsky, M.J., 3:45161
Carfagno, D.G., *See* Farmer, B.M., 3:45316
Carillon, A., *See* Jaegle, P., 3:45216
Carlson, D.E., SIMS analysis of deuterium diffusion in hydrogenated amorphous silicon, 3:45088
Carlson, T.A., Description of a polarized source of He I radiation for surface studies, 3:45271
Carnall, W.T., *See* Caird, J.A., 3:45162
Carpenter, F.D., Evaluation and recommendations on U.C. Lawrence Livermore Labortory Quality Assurance Program, 3:46086 (UCRL—13834)
Carpenter, P.A. III, *See* Wilson, W.F., 3:44212
Carrigan, R.A. Jr., Search for magnetic monopoles at the CERN Intersecting Storage Rings, 3:45578
Carroad, P.A., Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL—5962)
Carroll, J.B., *See* Nasser, M.A., 3:45573

Carroll, J.T., *See* Chadwick, G.B., 3:45585
Carson, D.B., Method for the catalytic cracking of two hydrocarbon fractions and equipment to carry it out, 3:44166
Carstens, D.H.W., Tritium handling and the preparation of DT-containing micro-targets for laser fusion experiments, 3:44319
Carter, G.W., *See* Lord, D.E., 3:45224
Carter, L.L., *See* Deutsch, O.L., 3:45820
Carter, W.J., Explosively produced fracture of oil shale. Progress report, April—June 1977, 3:44200 (LA—6901-PR)
Cartwright, D.C., Rate coefficients and inelastic momentum transfer cross sections for electronic excitation of N_2 by electrons, 3:45524
Casey, K.M., *See* Marks, J.R., 3:44436
Cashmore, R.J., *See* Longacre, R.S., 3:45634
Cassapakis, C.G., *See* Riley, P.J., 3:45704
Castagnos, L.F. Jr., Fluidized cracking catalyst regeneration apparatus, 3:44161
Castner, T.G., *See* Seager, C.H., 3:45101
Catchen, G.L., *See* Miller, J.M., 3:45751
Catlett, D.S., *See* Springer, R.W., 3:45005
Catto, P.J., Trapped electron instability in tokamaks: Analytic solution of the two-dimensional eigenvalue problem, 3:45877
Cavagnaro, D.M., Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970—1977, 3:44328 (NTIS/PS—78/0054)
The chemistry of silicone resins (a bibliography with abstracts). Report for 1964—January 1978, 3:45126 (NTIS/PS—78/0050)
Water pollution analysis and detection. Volume 2. July 1974—December 1976 (a bibliography with abstracts). Report for July 1974—December 1976, 3:45330 (NTIS/PS—78/0039)
Water pollution analysis and detection. Volume 3. 1977—January 1978 (a bibliography with abstracts). Report for 1977—January 1978, 3:45331 (NTIS/PS—78/0040)
Celmaster, W., Instantaneous approximation for a gauge theory with dressed vertices, 3:45592
Celnik, J., Simple albedo method for calculating effects of single-legged ducts, 3:44739
Cena, R., *See* Aiman, W.R., 3:44056
Cence, R.J., *See* Bell, J., 3:45567
Cester, R., Test of charge-conjugation invariance in p-barp interactions, 3:45576
Chadick, R.E., Solar ladder, 3:44506
Chadwick, G.B., Hybrid-bubble-chamber study of nucleon diffractive dissociation in 14-GeV/c π^{+-} p collisions, 3:45585
Chagelishvili, G.D., *See* Pataraya, A.D., 3:46066
Chaloupka, V., *See* Chadwick, G.B., 3:45585
Chamany, B.F., Shield design of a 100 MW(Th) Research Reactor, 3:44787
Chamberlin, J.H., *See* Browne, T.E., 3:44876
Chan, J., *See* Cho, Z.H., 3:45390
Chanet, R., Radiological protection. First European symposium on rad-equivalence, 3:45400
Chang, C.M., Simulation of the solar assisted heating and snow-melting system of a commercial bank building in Buffalo, New York, 3:44465 (CONF-761220—, pp 115-125)
Chang, K.H., *See* Chuang, A.S., 3:44690
Chang, L.N., Nonlinear gauge fields and the structure of gravity and supergravity theories, 3:45653
See Barnett, R.M., 3:45617
Chant, R.E., *See* Yuill, G.K., 3:44433
Chapin, D.L., TNS engineering trade study analysis, 3:46084 (ORNL/Sub—7117/24)
Chaplin, D.H., *See* Wilson, G.V.H., 3:45219
Chapman, C.C., Cooling of recycle hydrocarbon and/or alkylate product in isoparaffin-olefin alkylation, 3:44163
Chapman, C.R., *See* Fanale, F.P., 3:45477
Chapman, J.W., *See* Scharre, D.L., 3:45581
Chapman, P.K., Studies of orbital Eotvos experiments. Final report, 3:45468 (N—77-33226)
Chapman, R.L., *See* Kinnaman, T.L., 3:44783
Chapman, T.C., Fission product yields from 6—9 MeV neutron-induced fission of ^{235}U and ^{238}U, 3:45777
Chappell, W.R., Transport and biological effects of molybdenum in the environment, 3:45346
Charles, J.A., Use of one-dimensional compression tests and elastic theory in predicting deformations of rockfill embankments, 3:44121
Chaturvedi, P.K., *See* Ossakow, S.L., 3:45482
Chazalviel, J.N., *See* Dietz, R.E., 3:45103
Cheema, L.S., Cooling of low cost houses in North-East Brasil, 3:44937 (CONF-761220—, pp 263-266)
Chen, C.F., Laboratory solar pond, 3:44564 (CONF-761220—, pp 85-91)
Chen, C.W., No-bake systems in modern foundry technology, 3:44958 (IS-M—145)
Chen, H.C., *See* Sullivan, R.F., 3:44065, 3:44208
Chen, K., Rovibronic two-photon transitions of symmetric top molecules, 3:45489
Chen, K.W., Origin of muon-induced dimuons and scale violation at small x, 3:45615
Chen, P.J., *See* Brown, W.T., 3:45070
Chen, W.Y., Numerical study of normal-zone evolution and stability of composite superconductors, 3:45141
Chen Ning Yang, *See* Chou, T.T., 3:45640
Cheng, A., *See* Perez-Mendez, V., 3:45254
Cheng, F.T., *See* Fung, P.C.W., 3:46054
Cheng, K., *See* Gillespie, G.H., 3:45535
Cheng, K.T., *See* Johnson, W.R., 3:45497
Cheng, T.P., Weak-interaction-induced neutrino oscillations, 3:45619
Cheo, P.K., Far-infrared inspection of cable insulation. Interim report, 3:44633 (EPRI-EL—738)
Cherenkov, P.A., *See* Alferov, D.F., 3:45245
Cherkashov, Yu.M., *See* Egorov, Yu.A., 3:44827
Chernikov, V.A., *See* Gudilin, I.A., 3:45987
Chernin, D.P., Ion losses from end-stoppered mirror trap, 3:45889
Chernobrovin, V.I., *See* Gosteva, T.S., 3:45940
Chernyshev, V., International cooperation in MHD power generation, 3:44894
Chernyshov, Yu.A., *See* Elenskii, F.Z., 3:44027
Chertok, B.T., *See* Arnold, R.G., 3:45687
Chestnut, R.P., *See* Christensen, P.R., 3:45745
Chevokin, V.K., *See* Kas'yanov, Y.S., 3:45915
Chezganova, A.Y., *See* Bobykin, B.V., 3:45038
Chiang, T.T., Radial ion energy measurements in a fast theta pinch, 3:45883
Chibisov, M.I., *See* Zhdanov, V.P., 3:45978
Chiladze, B.G., *See* Amaglobeli, N.S., 3:45587
See Budagov, Y.A., 3:45590
Chin, G.Y., Hardness and bounding in A15 superconducting compounds, 3:45016
Chinowksy, W., *See* Tanenbaum, W., 3:45602
Chinowsky, W., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
Chiu, C., *See* Glazer, S., 3:44689
Chkalov, I.I., *See* Polishchuk, V.N., 3:45736
Cho, Z.H., Circular ring transverse axial positron camera, 3:45390
Choi, D., *See* Horton, W. Jr., 3:45994
Chon, W.Y., SUNYAB/EPRI Combined Injection ECC Program. Interim report, 3:44802 (EPRI-NP—757)
Chou, T.T., Energy Dependence of Opaqueness for pp Collisions at High Energies, 3:45574
Possible existence of a second minimum in elastic pp scattering, 3:45640
Christensen, P.R., Gamma-ray multiplicity moments from deeply inelastic collisions of ^{86}Kr and ^{144}Sm, 3:45745
Christian, W.G., *See* Adams, r.C., 3:44201, 3:44202
Christiansen, J.P., Evolution of the reversed-field pinch, 3:46099
Christie, W.H., *See* Narayan, J., 3:44362
Chriswell, C.D., Removal of gas chromatographable organic compounds from water by a spray vaporization technique, 3:45116
Chryssomallis, G.S., Measurement of fluorescence polarization at high pressure, 3:45123
Chu, D., *See* Perez-Mendez, V., 3:45254
Chu, K.R., Numerical study of the dissipative trapped-electron instability in tokamaks, 3:45890
Chu, T.L., Comparison of carrier lifetime measurements by photoconductive decay and surface photovoltage methods, 3:44369
Chu, Y.K., *See* Barish, B.C., 3:45566
Chu, Y.Y., Decay of ^{234}Th to the ^{234}Pa isomers, 3:45768
Chuang, A.S., Thermal stress analysis of the 300-MW(e) gas-cooled fast breeder reactor grid plate, 3:44690 (GA-A—14766)
Chudnenko, V.A., *See* Goncharov, N.I., 3:45985
Chukbar, K.V., Langmuir solitions in an inhomogeneous plasma, 3:46067
Chun, P.M., *See* Im, K.H., 3:44132
Churakov, V.V., *See* Kuntsevich, B.F., 3:45204
Churakova, T.A., *See* Batkin, I.S., 3:45519
Church, H.W., *See* Sprung, J.L., 3:44811
Ciletti, M.D., *See* Jensen, B.H., 3:44419
Cipollini, N.E., *See* Holroyd, R.A., 3:44999
Ciprios, G., Redox bulk energy storage system study. Volume 1. Final report, 18 February 1976—30 January 1977, 3:44908 (N—77-33608)
Redox bulk energy storage system study. Volume 2. Final report, 18 February 1976—30 January 1977, 3:44909 (N—77-33609)
Clark, B.E., Analytical laboratory to facilitate international safeguards, 3:44317
Clark, R.B., Oiled seabird rescue and conservation, 3:44179
See Mann, K.H., 3:44184
Clark, R.C. Jr., Observations of a cold-water intertidal community after 5 years of a low-level, persistent oil spill from the General M.C. Meigs, 3:45411
Clark, R.E.H., *See* Sampson, D.H., 3:45531
Clark, T.D., *See* Lord, D.E., 3:45224
Clark, W.M. Jr., Ion plasma electron gun research. Final report, 1 June—15

November 1977, 3:45158 (AD-A—048621)
Clarkson, T.W., Review of dose-response relationships resulting from human exposure to methylmercury compounds, 3:45423
Claypoole, G., *See* Leon, I.W., 3:44614
Clayton, E.D., *See* Bierman, S.R., 3:45149
See Durst, B.M., 3:45150
Cleary, T.P., *See* Gross, E.E., 3:45712
See Malbrough, D.J., 3:45708
Clegg, G.T., *See* King, P.J., 3:44888
Clegg, L.J., Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 3: reprocessed fuel: plutonium product, and high level waste, 3:44264 (AECL—4436/2)
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 1: starting materials: uranium ore, separated uranium and uranium mill tailings, and Part 2: irradiated fuel, 3:44661 (AECL—4436/1)
Cleland, W.E., *See* Herbert, M.L., 3:45568
Clem, J.R., Critical currents of a one-dimensional array of superconducting vortices in a periodic pinning potential, 3:45845 (IS-M—137)
Clement, C.F., Plutonium redistribution in mixed-oxide $(U,Pu)O_2$ nuclear fuel elements, 3:44772 (AERE-TP—714)
Clement, R., Air/water heat pump, 3:44944 (NP-tr—2012)
Cleveland, B.T., *See* Bahcall, J.N., 3:45453
Cleveland, J.C., *See* Ball, S.J., 3:44809
Clifton, B.J., *See* Fetterman, H.R., 3:45907
Cline, D., *See* Wanderer, P., 3:45570
Close, D.A., Nuclear charge distributions deduced from the muonic atoms of $^{2}32Th$, $^{2}35U$, $^{2}38U$, and $^{2}39Pu$, 3:45766
Close, J.A., *See* Wessol, D.E., 3:44731
Coady, J.R., *See* Clegg, L.J., 3:44264, 3:44661
Cobb, J.C., Suntrap insolator/insulator possible application to walls and roofs of schools, 3:44405 (CONF-761220—, pp 15-16)
Cobb, J.H., Azimuthal correlations of high—transverse-momentum π^0 pairs, 3:45559
Cockayne, J.E., Tactical implications of air blast variations from nuclear tests. Final report, 15 April—30 November 1976, 3:45286 (AD-A—048802)
Cocke, W.J., Stimulated emission and absorption in classical systems, 3:45863
Coffey, H.E., Solar—geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977—August 1977, 3:45452 (PB—275858)
Coffey, J.C., *See* Wilson, W.F., 3:44212
Coffin, C.T., *See* Bell, J., 3:45567
Coffin, J.P., $^{18}O + {}^{12}C$ and $^{18}O + {}^{13}C$ fusion-evaporation reactions, 3:45703
Cohen, D., *See* Kramer, S.L., 3:45577
Cohen, J.S., Theory of inelastic collisions between low-lying excited- and ground-state Ne atoms, 3:45536
Cohen, M.L., *See* Ihm, J., 3:45836
Cohen, S.A., Lower limits for parallel impurity fluxes in the PLT edge plasma, 3:45905 (PPPL—1440)
O-H charge exchange in cold, dense hydrogen plasmas, 3:45959
Cohn, J.G., *See* Mannion, W.A., 3:44982
Cohn, S.H., *See* Ellis, K.J., 3:45379
Coker, W.R., *See* Hoffman, G.W., 3:45702
Coleman, M.G., Semiconductor solar energy device, 3:44377
Colgate, S.A., Phenomenological model of solar flares, 3:45454
Radio emission from quasars and BL Lac objects by coherent plasma oscillation and stimulated Compton scattering, 3:45450 (LA-UR—78-1199)
Collier, L., Designing for bulk output from thin seams using the AS buttock shearer, 3:44105
Collins, L.A., *See* Cohen, J.S., 3:45536
Collins, R.E., Geothermal storage of solar energy for electric power systems, 3:44558 (CONF-761220—, pp 23)
Colmenares, C., *See* Bastasz, R., 3:45031
Colombant, D.G., *See* Mosher, D., 3:45933
Colome, J., *See* Duverger de Cuy, G., 3:44824
Colwell, R.R., Microbial ecology studies of the Metula spill in the Straits of Magellan, 3:45409
Comiso, J.C., *See* Doering, R., 3:45715
Compton, R.N., Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
Concus, P., *See* Albright, N., 3:45549
Connell, D.W., *See* Shapiro, M.A., 3:45349
Connolly, T.J., Foundations of nuclear engineering, 3:44610
Conrad, J.R., Neutral-beam divergence due to imperfect magnetic shielding, 3:45880
Conrad, R., Prototype experiment of an irradiation facility for large HTR fuel specimens in the HFR Petten. Project E 91 - 0, 3:44779 (EUR—5456)
Conte, F., One year of Phenix operation, 3:44708 (BNWL-tr—317)
Contos, G., *See* Abrams, E.F., 3:45362
Conway, J.G., *See* Shalimoff, G.V., 3:45499
Conwell, C.N., *See* Dooley, J.R. Jr., 3:44249
Cook, C.S., Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1—June 30, 1976, 3:44900 (FE—2238-1)
Cook, J., Solar aesthetics and incentives, 3:44401 (CONF-761220—, pp 19-20)
Cool, T.A., *See* Wolga, G.J., 3:45159
Coolen, F.C.M., Electron density and electron temperature in a neon plasma generated by 20-MeV protons, 3:45982
Cooley, J., *See* Mayo, D.W., 3:45333
Cooper, B.J., *See* Acres, G.J.K., 3:44985
Cooper, C.D., *See* Compton, R.N., 3:45527
Cooper, J.F., *See* Subramanian, G., 3:45391
Cooper, M.D., *See* Burman, R.L., 3:45697
Cooper, R.B., *See* Kazmerski, L.L., 3:45114
Cooper, W.E., *See* Herbert, M.L., 3:45568
Cooperstein, G., *See* Mosher, D., 3:45933
Copeland, G.L., Volume reduction of low-level contaminated metal waste by melting: selection of method and conceptual plan, 3:44282 (ORNL/TM—6388)
Copping, B.G., Solar heater, 3:44517
Cordell, K.R., *See* Doering, R., 3:45715
Cordey, J.G., Waves and instabilities in plasmas. Report on the fusion aspects of the third international congress, Palaiseau, France, 27 June - 1 July 1977, 3:45931
Corkum, P.B., Recent developments in high power CO_2 laser mode-locking and pulse selection, 3:45214
Corlis, N.E., Description, operation, and diagnostic routines for the adaptive intrusion data system, 3:44310 (SAND—77-1029)
Cornelis, E., *See* Staveloz, P., 3:45770
Coroniti, F.V., *See* Albee, A.L., 3:45476
See Fanale, F.P., 3:45477
Corum, J.M., Thermal ratchetting tests of Type 304 stainless steel pipe: specimens TTT-1 and TTT-2, 3:45013 (ORNL—5386)
Cosman, E.R., *See* Lazzarini, A.J., 3:45699
Costa, L., *See* Beslu, P., 3:44654
Costello, D.G., *See* Steinman, D.K., 3:44235
Cote, W., Different reactor types and the Belgian option, 3:44722
Coudert, C., Probabalistic analysis of the protection of a PWR against overpressure, 3:44804 (EUR—5640)
Courtemanche, A.N., *See* Lichtenstadt, J., 3:45758
Cover, R.A., Tamper temperature and compression from simultaneous proton and alpha-particle measurements in laser fusion experiments, 3:45906
Cowan, A., Methods employed by UKAEA in the evaluation of flaws, 3:44748 (IAEA—18; CONF-751268—, pp 23-27)
Cowley, A.A., *See* Wall, N.S., 3:45796
Cox, C.W., Electric heat balance calorimeter. Final report, 3:45268 (NUREG/CR—0054)
Cox, J.R. Jr., *See* Ter-Pogossian, M.M., 3:45382
Cox, K.E., Thermochemical processes for hydrogen production. Progress report, August 1, 1977—February 28, 1978, 3:44327 (LA—7234-PR)
Coxon, J.A., *See* Tellinghuisen, P.C., 3:45176
Crabtree, G.W., *See* Dye, D.H., 3:45029
Crago, W.A., *See* Pothier, N.E., 3:44676
Craig, R.A., *See* Schwerzel, R.E., 3:44390
Craik, N.G., Support required from Canada in the operation and maintenance of CANDU stations overseas, 3:44677 (CONF-760688—, pp 112-129)
Crawford, E.A., *See* Hoffman, A.L., 3:45876
Crawford, H.J., *See* Heckman, H.H., 3:45572
Crawford, J.H. Jr., *See* Lee, K.H., 3:45086
Crawford, M.L., *See* Holtzscheiter, E.W., 3:44324
Creutz, M., Higgs mechanism in the temporal gauge, 3:45664
Crisp, M.J., *See* Kirkorian, E., 3:44379
Crockett, P.W., Biological effects of laser radiation (a bibliography with abstracts). Report for 1964—January 1978, 3:45397 (NTIS/PS—78/0036)
Cronauer, D.C., Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly report, July—September 1976, 3:44033 (FE—2305-3)
Research and development as an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. Quarterly report, September—November 1977, 3:44060 (FE—1800-21)
Crooks, J.B., Photon and positive ion production from collisions of superthermal hydrogen atoms with lithium atoms and molecules, 3:45523
Crouch, W.B., Method to desulphurize crude petroleums, heavy fuel oils and similar heavy oils, 3:44168
Crouthamel, C.E., Fuel performance improvement program. Quarterly progress report, October—December 1977, 3:44639 (COO—4066-5)
Crowe, J.C., Electromagnetic methods for inspection of ferrous tubing, 3:45222 (BN-SA—311)
Cseh, J., *See* Paul, M., 3:45716
Culkowski, A.H., *See* Bertini, H.W., 3:45641
Culver, R.H., Feasibility of investigating the mechanisms of aortic trauma using high-speed cineradiography. A pilot

study. Final report, 15 May—31 August 1977, 3:45386 (PB—275632)
Cumalat, J.P., *See* Caldwell, D.O., 3:45560
Cumming, J.B., Spallation of copper by 80-GeV ^{40}Ar Ions, 3:45733
Cunningham, D.C., Reactor safety: a literature search, 3:44814 (TID—3525-R5-S11)
Cunningham, M.E., *See* Bryan, J.B., 3:45433
Cuomo, J.J., Solar cell and method of production, 3:44382
Curto, P., *See* Rebibo, K., 3:44348
Cutting, F.M., Heliostat structural stability as a function of solat heating and ambient temperature changes, 3:44398 (CONF-761220—, pp 231-232)
Czauderna, N., *See* Weber, K.H., 3:44102

D

D'Amato, R., *See* Pietrafesa, L.J., 3:45436
D'Silva, A.P., Multilaboratory analytical quality control for the hydrochemical and stream sediment reconnaissance, 3:44213 (IS—4370)
D'yachenko, Yu.V., *See* Biryhkov, Yu.V., 3:44077
Da Costa Barcellos, E., Process for obtaining oil, gas, sulfur, and other products from oil shale, 3:44206
Dabiri, A., Experimental and theoretical performance study of solar collectors, 3:44479 (CONF-761220—, pp 73)
Dabrowski, A.J., Characteristic x-ray spectra of sodium and magnesium measured at room temperature using mercuric iodide detectors, 3:45255
Dagenhart, W.K., *See* Whealton, J.H., 3:46103
Dale, J., *See* Gordon, D.C. Jr., 3:45413
See Keizer, P.D., 3:44177
Dalen, V., Gassim. user's description: a gas reservoir simulation model, 3:44192 (N—77-33467)
Dalessandro, J.A., *See* Hopkins, G.R., 3:46127
Damrath, J., *See* Zabeltitz, C. von, 3:44453
Damshala, P.R., Optimization of heat exchangers for solar concentrators, 3:44495 (CONF-761220—, pp 237-242)
Danagulyan, A.S., *See* Asaturyan, V.M., 3:45563
Danguillier, W., *See* Grams, W., 3:44026
Daniels, J., Role of borehole electrical measurements in uranium exploration, 3:44244 (USGS-CIRC—753, pp 17-19)
Daniels, K., Daylight loading through protection against the Sun, 3:44930
Danileiko, M.V., Multimode ring laser, 3:45196
Danilov, N.K., *See* Danileiko, M.V., 3:45196
Darden, C.W., *See* Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Daree, K., Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2. Further development and optimization of the chemical CO-laser, 3:45167 (N—77-33514)
Darnley, A.G., New and recent results from the Canadian uranium reconnaissance program, 3:44230 (USGS-CIRC—753, pp 63-64)
Darr, D.G., *See* Anderson, R.T., 3:44275
Das, G., Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H, 3:45525
Pseudopotential study of some prominent band systems of the spectra of the I_2 molecule, 3:45505
Das, S.K., Surface damage of molybdenum and TZM alloy under D^+ impact, 3:45060
Dashen, R., *See* Callan, C.G. Jr., 3:45666
Daughtry, J.W., *See* Ombrellaro, P.A., 3:44780
Davenport, P.A., Re-circulating power, unit costs and thermal pollution of fusion power stations, 3:46132
Davey, W.B., Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report, 3:44860 (PB—274411)
Davids, C.N., Mass and β decay of the new isotope ^{57}Cr, 3:45721
See Murphy, M.J., 3:45732
See Norman, E.B., 3:45729
Davidson, J., Planning and the rural environment, 3:44861
Davidson, J.P., *See* Close, D.A., 3:45766
Davidson, M., Classical realization of quantum mechanics, 3:45854
Davidson, R.C., Influence of magnetic shear on the lower-hybrid-drift instability in toroidal reversed-field pinches, 3:46003
Quasi-linear stabilization of lower-hybrid-drift instability, 3:45995
See Goren, Y., 3:45996
Davidson, V., *See* Chadwick, G.B., 3:45585
Davis, C.G., Theoretical models of 10 day Cepheids, 3:45440
Davis, D.O., *See* Ter-Pogossian, M.M., 3:45382
Davis, H.L., *See* Noonan, J.R., 3:45011
See Ulehla, M., 3:45837
Davis, K.E., *See* Collins, R.E., 3:44558
Davis, L.E., *See* Campbell, J.A., 3:45304
Davis, L.K., *See* Cook, C.S., 3:44900
Davis, P.J., *See* Caldwell, D.O., 3:45560
Davis, P.R., Comparison of experimental results with analytical predictions for LOFT nonnuclear tests with core simulator. Final report, 3:44803 (EPRI-NP—800)
Davis, R. Jr., *See* Bahcall, J.N., 3:45453
Davis, R.S., CONIFERS: a neutronics code for reactors with channels, 3:44730 (AECL—5305)
Davis, T.N., *See* Wescott, E.M., 3:45484
Davis, T.O., Respirator studies for the DOE Division of Operational and Environmental Safety. Progress report, October 1, 1976—September 30, 1977, 3:45147 (LA—6969-PR)
Davison, D.K., *See* Davis, C.G., 3:45440
Davituliani, A.A., *See* Buishvili, L.L., 3:45681
Davydenko, V.I., *See* Bel'chenko, Y.I., 3:45504
Dawley, R.W., Solar heat absorber, 3:44500
Dawson, J.M., *See* Kamimura, T., 3:46044
Day, D., *See* Arnold, R.G., 3:45687
De, J.N., *See* Birkelund, J.R., 3:45711
de Beer, G.P., Neutrons streaming through conical ducts, 3:45822
De Jesus, A.S.M., Review of nuclear techniques for process control in the gold and uranium mining industries, 3:44255
de Saussure, G., *See* Perez, R.B., 3:45720
de Vellis, J., Hormonal effects on differentiation in neutral cultures, 3:45371 (UCLA—12-1144)
See McCarthy, K.D., 3:45367
de Wilde, G., Solar collector apparatus, 3:44502
Dean, N.R., Glow discharge processing versus bakeout for aluminum storage ring vacuum chambers, 3:45251
DeBlanc, H.J. Jr., Noninvasive brain imaging: computed tomography and radionuclides, 3:45384
Dech, V.N., Experience in application of a probability model for interpreting the results of geological and well logging studies of fractured reservoirs, 3:44149
DeDominicis, L.D., *See* Cook, C.S., 3:44900
Deeg, H.J., Theoretical and experimental investigations on shock waves in gas-solid flows, 3:44903 (N—77-33468)
DeGrand, T., Radial excitations of hadronic bags, 3:45627
DeGroot, A.J., Field observations on the transport of heavy metals in sediments, 3:45343
DeGroot, J.S., *See* Woo, W., 3:45887
Dehmer, J.L., *See* Dehmer, P.M., 3:45490
Dehmer, P.M., Photoelectron spectra of Ar_2 and Kr_2 and dissociation energies of the rare gas dimer ions, 3:45490
del Papa, C., Structure functions and charge ratios in muon-nucleon scattering, 3:45611
See Bunnell, K., 3:45564
Delagrange, H., Fission-evaporation competition in Pu isotopes of mass 235—239, 3:45763
See Fleury, A., 3:45764
Delameter, W.R., *See* Pouliot, H.N., 3:44973
DeLand, F.H., *See* Budinger, T.F., 3:45393
Delaney, J.B., Antitrust review of nuclear power plants. Recent developments, 3:44711 (NUREG—0447)
Delevaux, M.H., *See* Hills, F.A., 3:44243
Dellinger, T., *See* Cook, C.S., 3:44900
Demchenko, V.V., *See* Grishaev, V.I., 3:46028
Demco, D., *See* Naskidashvili, I.A., 3:45064
Demekhina, N.A., *See* Asaturyan, V.M., 3:45563
Demichelis, F., Transmission solar focusing collector, 3:44552
Demutskii, V.P., *See* Akhiezer, A.I., 3:46024
Dengler, L.A., Microcracks and matrix deformation in stressed gas-bearing sandstones, 3:44193 (UCRL—80328)
Denisenko, A.A., *See* Antipov, Y.M., 3:45586
Denisov, S.P., *See* Antipov, Y.M., 3:45586
Dennis, L.C., *See* Doering, R., 3:45715
Dentz, D., Manufacturing methods and technology engineering for neodymium-doped YAG laser rods. Quarterly progress report No. 2, 1 June—31 August 1977, 3:45160 (AD-A—048662)
Deparade, K., Lowering energy costs. A practical guide for purchase and operation, 3:44619
der Mateosian, E., *See* Kistner, O.C., 3:45749
Derenzo, S.E., Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
Derevyankin, G.E., *See* Bel'chenko, Y.I., 3:45504
Derkachenko, V.N., Characteristics of the contribution of Dy^3+ and Tb^3+ ions to the anisotropy of Dy/sub x/Tb/sub 1-x/FeO_3 orthoferrites, 3:45098
Dernedde, W., Possibilities of using solar energy in dryers for agricultural products, 3:44458
Deron, S., *See* Clark, B.E., 3:44317
DesHaies, R., *See* Campbell, F.R., 3:44770
DeSilva, A.W., *See* Chiang, T.T., 3:45883
Desmarchais, W.E., *See* Shallenberger, J.M., 3:44762
Desprets, A., *See* Calamand, D., 3:44704
Dettmering, W., Economic and social aspects of research and development, 3:44867

Deutsch, O.L., Simultaneous global calculation of flux and importance with forward Monte Carlo, 3:45820
Deutsch, S., Nuclear safety. A basic controversy, 3:44832
Devereux, M.J., *See* Zeidman, B., 3:45700
Devillers, C., *See* Beslu, P., 3:44655
DeVoe, R.G., *See* Tanenbaum, W., 3:45602
Devyatov, A.M., *See* Volkova, L.M., 3:45925
di Bona, G., *See* Bourdier, A., 3:46052
Di Pasquantonio, F., *See* Barbucci, P., 3:44740
Diamond, R.M., *See* Guidry, M.W., 3:45748
Diamond, R.N., *See* Bell, J., 3:45567
Diamond, S., Solar cooling of a 25,000 square foot office building, 3:44422 (CONF-761220—, pp 259-261)
Diaz, A.F., *See* Guth, E.D., 3:44032
DiBianca, F.A., *See* Bell, J., 3:45567
Dicello, J.F., Investigation of the microdosimetric characteristics of broad, therapeutic beams of negative pions at LAMPF, 3:45396 (LA-UR—78-1205)
See Zaider, M., 3:45395
Dickinson, K., *See* Cook, C.S., 3:44900
Dickinson, K.A., Uranium and thorium distribution in continental tertiary rocks of the Cook Inlet Basin and some adjacent areas, Alaska, 3:44234 (USGS-CIRC—753, pp 70-72)
Didenko, L.A., *See* Angelov, N., 3:45589
Diebold, R., *See* Kramer, S.L., 3:45577
Diefenbacher, W., *See* Bechthold, W., 3:44304
Dieterly, D., *See* Meyer, R.A., 3:45730
Dietz, R.E., Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
Difilippo, F.C., *See* Perez, R.B., 3:45720
Dijck, G. van, *See* Tiberghien, E., 3:44935
Dimoplon, G., *See* Sheen, S.H., 3:45526
Dine, M., *See* Appelquist, T., 3:45670
Dini, J.W., *See* Johnson, H.R., 3:45014
DiStefano, T.H., *See* Cuomo, J.J., 3:44382
Ditchfield, R., *See* Binkley, J.S., 3:45544
Ditmars, J.D., *See* Paddock, R.A., 3:45360
Dmitriev, S.P., Observation of magnetic resonance in the 1^1S_0 ground state of optically oriented ^3He atoms by the use of transverse modulation of the magnetic field, 3:45513
Dmitriev, V.M., Temperature dependence of the nonequilibrium-field penetration depth in a superconductor, 3:45046
Dobbin, K.D., *See* Ombrellaro, P.A., 3:44780
Dobronravov, V.F., Measurement of the reflectance of vitrinities in partially polarized light, 3:44082
Dobrotin, N.A., *See* Vernov, S.N., 3:45438
Dobrozemsky, R., *See* Viehboeck, F.P., 3:44418
Dobson, W.G., *See* Biederman, R.R., 3:44801
Dodge, C.E., *See* Lilly, G.P., 3:44819
Dodge, H.W. Jr., Thinning of the Fox Hills sandstone, Crook County, Wyoming: a possible guide to uranium mineralization, 3:44224 (USGS-CIRC—753, pp 50-51)
Dodo, T., Gradient B drift instability in toroidal systems, 3:46030
Doelp, L.C., Oxidative automotive emission control catalysts: selected factors affecting catalyst activity, 3:44994
Doering, O.C. III, Energy-cased analysis of alternative production methods and cropping systems in the Corn belt, 3:44853 (PB—273896)
Doering, R., Correlated energy spectra of light fragments from 720-MeV α-induced reactions, 3:45715
Doi, R., Distribution of mercury in fish and its form of occurrence, 3:45348
Dojlido, J.R., Supplement to effects of thermal discharges on physico-chemical processes and water quality, Vistula River, Poland. Final report, January 1973—December 1975, 3:45361 (PB—273580)
Dokshitser, Y.L., Associative multiplicity in scattering by a deuteron with large momentum transfer, 3:45643
Dolbear, G.E., Variation of selectivity with support chemistry in NO/sub x/ removal catalysts, 3:44990
Dole, M., *See* Patel, V.M., 3:45125
Dolginov, A.Z., Origin of the intrinsic linear polarization of the optical emission of stars with infrared excesses, 3:45447
Dolinski, U., Problems of price determination for gas due to connections between the international markets of natural gas supply and demand in the Federal Republic of Germany. DIW study on changes proposed by the Monopoly Commission, 3:44887
Dollezhal', N.A., Fundamental studies of system investigations in nuclear energetics, 3:44721
Donangelo, R., *See* Guidry, M.W., 3:45748
Dong, R.G., Effective mass and damping of submerged structures, 3:44817 (UCRL—52342)
Donnadieu, A., Optical performance of absorber-reflector combinations for photothermal solar energy conversion, 3:44374
Donnelly, R.L., *See* Bynum, F.A., 3:44489
Donoghue, J.F., Hadronic polarization in neutrino scattering, 3:45612
Dooley, J.R. Jr., Examples of uranium distribution graphics in geologic rock specimens illustrated with the Radioluxograph, induced fission tracks, and other tracks methods, 3:44249 (USGS-CIRC—753, pp 32)
Dorfan, D., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Dorfan, J.M., *See* Jaros, J.A., 3:45561
Dormuth, K.W., Study of the running-in period of a CANDU-PHW thorium converter, 3:44662 (AECL—5391)
Dorning, J.J., *See* Ingersoll, D.T., 3:45816
Dorogov, A.F., *See* Bel'chenko, Y.I., 3:45504
Doroszlai, P., Application of the chemical heat pump for heat storage: the system 'PAWA', 3:44846
Dostrovsky, I., *See* Bahcall, J.N., 3:45453
Doty, J.W., *See* Alexander, B.M., 3:44281
Douglas, D.D., *See* Davis, T.O., 3:45147
Douglas, M.H., Transport of a nonneutral electron plasma due to electron collisions with neutral atoms, 3:45955
Douglass, D.C., *See* Gillen, K.T., 3:45494
Dover, C.B., Strong tensor forces and the possibility of high-spin states in the nucleon-antinucleon system, 3:45632
Dovgopol, V.P., *See* Pan, V.M., 3:45042, 3:45043
Dowling, A.R., Effect of defects on structural failure: A two-criteria approach, 3:44749 (IAEA—18; CONF-751268—, pp 185-205)
Drabkin, M., *See* Abrams, E.F., 3:45362
Dradesky, E.L., Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report, 3:44624 (PB—274395)
Drbal, K., Relationship between content of copper in fish, plankton, and lake water, 3:45337 (UCRL-Trans—11369)
Drell, S.D., Field theory on a lattice: Absence of goldstone bosons in the U(1) model in two dimensions, 3:45655
Dress, W.B., *See* Carlson, T.A., 3:45271
Drickamer, H.G., *See* Chryssomallis, G.S., 3:45123
Drimmie, R., *See* Jackson, T.A., 3:44209
Dris, M., *See* Herbert, M.L., 3:45568
Driver, P.M., *See* Riddiford, C.L., 3:44483
Drobot, A.T., *See* Marsh, S.J., 3:45882
Druzhinin, V.V., *See* Tatsenko, O.M., 3:45071
Dryakhlushin, V.F., *See* Romanov, Y.A., 3:46064, 3:46071
Dubberley, A.E., Localized duct wall cyclic thermal stresses in vented assembly LMFBR cores, 3:44692 (GEFR—00351)
Dubensky, R.G., Performance of low cost solar panels, 3:44480 (CONF-761220—, pp 75-79)
Dubi, A., Monte Carlo Track Rotation Estimator, 3:45821
Dubin, F.S., Energy conservation studies for new and existing buildings produce guidelines and standards-tools for decision making, 3:44924 (CONF-761220—, pp 151-156)
New energy conservation ideas for existing and new buildings, 3:44923 (CONF-761220—, pp 149)
Dubinin, A.A., *See* Abagjan, A.A., 3:44769, 3:45824
Dubinski, Y., *See* Amaglobeli, N.S., 3:45587
Dubovoi, L.V., *See* Gosteva, T.S., 3:45940
Dudnikov, V.G., *See* Bel'chenko, Y.I., 3:45504
Dudziak, D.J., *See* Miller, W.F. Jr., 3:44734
Duerre, D.E., *See* Hawke, R.S., 3:45089
Duggan, H.E., *See* Budinger, T.F., 3:45393
Duke, D.W., Determination of the sea-quark distributions in the proton by single-particle inclusive reactions, 3:45604
Dunn, J.T., *See* Jackman, A.H., 3:44678
Dunn, P.F., Two-phase liquid-metal MHD generator experiments and pressure-gradient correlations, 3:44902 (CONF-780336—1)
Dunning, D.E. Jr., *See* Killough, G.G., 3:45402
Dunning, T.H. Jr., Covalent and ionic states of the rare gas monofluorides, 3:45174
Duong-van, M., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Durham, W.B., *See* Swift, R.P., 3:45076
Durkin, J.A., Method to desulphurize heavy mineral oils, 3:44170
Durst, B.M., Handbook of critical experiments benchmarks, 3:45150 (PNL—2700)
See Bierman, S.R., 3:45149
Dusza, P., *See* Das, S.K., 3:45060
Duthu, D., *See* Jenkins, P.E., 3:44404
Dutton, L.M.C., Methods of calculation used in the design of the shielding within the primary containment of a commercial S.G.H.W.R., 3:44684
Duval, J.S., *See* Pitkin, J.B., 3:44245
Duverger de Cuy, G., Filtration of aerosols produced by a sodium fire, 3:44824
Dvorak, A.J., Assessment of the health and environmental effects of power generation in the Midwest. Volume II. Ecological effects, 3:44088 (ANL/AA—6(Vol.2)(DRAFT))
Dwyer, H.A., Numerical modeling of unsteady flame propagation, 3:45130 (SAND—77-8275)
Dyatlov, M.K., Frequency selection in a helium—cadmium laser with transverse rf excitation, 3:45207

Dye, D.H., Fermi surface of platinum, 3:45029
Dyer, P., *See* Vandenbosch, R., 3:45734
Dylla, H.F., Turbomolecular pump vacuum system for the Princeton Large Torus, 3:45226
See Cohen, S.A., 3:45905, 3:45959
Dyuzhev, G.A., *See* Baksht, F.G., 3:45926, 3:45927
Dzhelepov, V.P., *See* Amaglobeli, N.S., 3:45587
Dzhmukhadze, S.V., *See* Angelov, N., 3:45589

E

Eagle, M., *See* Reimers, R.S., 3:45344
Eaton, J.R.P., *See* Martin, A., 3:44765
Ebersbach, K.F., *See* Schaefer, H., 3:44917
Ech, F.A., *See* Antipov, Y.M., 3:45586
Eckenfelder, W.W. Jr., *See* Adams, C.E. Jr., 3:45352
Eckert, K., Fuel metering device, 3:44975
Eckhoff, N.D., *See* Pytlinski, J.T., 3:44417
Economou, T.E., *See* Dabrowski, A.J., 3:45255
Eden, J.G., *See* Golden, J., 3:45170
Eder, H., Performance of solar driven absorption refrigerator systems, 3:44466 (CONF-761220—, pp 283)
See Hatami, R., 3:44497
Edge, R.D., *See* Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Edmonds, P.H., Energy loss to the wall and limiter in normal ORMAK discharges, 3:46091
Edwards, D. Jr., Nitrogen pressure in a vacuum system, 3:45227
Pressure measurements in a cryogenic environment, 3:45225
Rate at which molecules strike a surface or orifice in a vacuum system, 3:45865
Edwards, D.W., Thermal distribution and storage system for solar and other heating and cooling, 3:44841
Edwards, L.L., Computer simulations of a 1/5-scale experiment of a Mark I boiler water reactor pressure-suppression system under hypothetical LOCA conditions, 3:44815 (UCID—17782)
Edwards, R.Q., *See* Kuhl, D.E., 3:45388, 3:45392
EerNisse, E.P., *See* Krefft, G.B., 3:45104
See Seshan, K., 3:45100
Eggers, G.H., FMSC collector subsystem being supplied for Sandia Laboratories' total energy system, 3:44488 (CONF-761220—, pp 207-209)
Eggleston, F.T., Failure Modes and Effects Analysis (FMEA) of the Residual Heat Removal System, 3:44650 (WCAP—8967)
Egloff, R.M., *See* Caldwell, D.O., 3:45560
Egorov, V.S., Quantum oscillations of thermoelectric power under magnetic breakdown conditions, 3:45052
Egorov, Yu.A., Radiation safety of nuclear power plants with large channel-type reactors, 3:44827
Egrican, A.N., *See* Allen, R.W., 3:44428
Ehrfeld, U., *See* Becker, E.W., 3:44257
Ehrfeld, W., *See* Becker, E.W., 3:44257
Ehrhard, E., *See* Baron, G., 3:44335
Eichler, E., *See* Sayer, R.O., 3:45750
Eidelman, S.I., Production of four pions in e^+e^- collisions and partial conservation of axial current, 3:45606
Einhorn, M.B., Topological excitations in the Abelian Higgs model, 3:45662
Eisele, E., Internal combustion engine with air-fuel mixture compression, 3:44979
Eisele, F.L., *See* Pope, W.M., 3:45093
Eisele, G.R., *See* Mraz, F.R., 3:45405
Eisen, Y., *See* Henning, W., 3:45740
Eisenbeiss, G., *See* Becker, E.W., 3:44257
Eisner, A.M., *See* Caldwell, D.O., 3:45560
Ekdahl, C.A., *See* Sethian, J.D., 3:45913
Elenskii, F.Z., Addition of lean coals to charges with an increased content of gas coals of the Western Donbass, 3:44027
Elesin, V.F., Theory of phase transitions in nonequilibrium superconductors with allowance for phonon reabsorption, 3:45838
Elfimov, A.G., *See* Khorasanov, L.G., 3:46057
Elliott, G.E., *See* Berry, D.A., 3:44066
Ellis, H.W., *See* Pope, W.M., 3:45093
Ellis, K.J., Mobile prompt-gamma in vivo neutron activation facility, 3:45379 (BNL—24290)
Ellis, S.D., *See* Cahn, R.N., 3:45595
Ellis, W.P., Application of a double-pass CMA to ion scattering from some actinide materials, 3:45012
Elovskaya, L.T., *See* Likhachev, Yu.P., 3:45404
Elston, S.B., *See* Vane, C.R., 3:45534
Elwyn, A.J., *See* Meyer-Schuetzmeister, L., 3:45722
Ely, R., *See* Chadwick, G.B., 3:45585
See Jaros, J.A., 3:45561
Ely, R.P., *See* Scharre, D.L., 3:45581
Elzinga, M.B., *See* Frederick, J.R., 3:45223
Emery, V.J., One-dimensional fluctuations and the chain-ordering transformation in Hg/sub 3-delta/AsF_6, 3:45081
Emig, G., Selective catalytic oxidation of hydrocarbons as a challenge to the chemical engineer, 3:44164
Emmett, J., *See* Trenholme, J., 3:46123
Endorf, R., *See* Bell, J., 3:45567
Engel, D., Residential solar demonstration program of the U.S. Department of Housing and Urban Development, 3:44455
Engelhard, P., *See* Weisang, J.E., 3:44169
Engelmann, R.J., *See* Fisk, R.J., 3:45575
Engels, E. Jr., *See* Herbert, M.L., 3:45568
Engelstein, P., *See* Coffin, J.P., 3:45703
Engholm, B.A., *See* Sund, R.E., 3:44660
England, A.C., *See* Edmonds, P.H., 3:46091
England, W.B., Theoretical studies of MHD plasma molecules. I. Potential energy curves and dipole moments of linear KOH, 3:45870
Enright, G.D., *See* Richardson, M.C., 3:45930
Eremin, I.V., Comparison of the classification of coals used in individual countries with the International Classification, 3:44083
Petrographic characteristics and technological properties of coals of the Krasnoarmeiskii region of the Donbass, 3:44080
Erickson, N.R., *See* Fetterman, H.R., 3:45907
Eriksson, L., *See* Cho, Z.H., 3:45390
Erkkila, B.H., *See* Plasil, F., 3:45746
Ermolenko, T.E., *See* Nefedov, Yu.A., 3:44084
Erokhin, N.S., Collapse of Alfven waves, 3:46074
Erskine, J.R., Energy levels of ^{239}U observed with the (d,p) reaction, 3:45769
See Rehm, K.E., 3:45725
Erskine, W. Jr, *See* Ciprios, G., 3:44908, 3:44909
Eschwege, H., Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED—78-93)
Pipeline safety: need for a stronger Federal effort, 3:45155 (CED—78-99)
Eshelman, F.R., Single-crystal elastic constants of Al_2Cu, 3:45024
Estabrook, K., *See* Woo, W., 3:45887
Estes, R., *See* Horton, W. Jr., 3:45994
Estiot, J.C., Integral data for the prediction of neutron propagation in iron—sodium mixtures, 3:44705
Evans, J.C. Jr., *See* Bahcall, J.N., 3:45453
Evans, M.L., *See* Riley, P.J., 3:45704
Evans, R.D., Alternate working fluids for solar air conditioning applications, 3:44439 (CONF-761220—, pp 363-364)
Evdokimov, V.V., *See* Vereshchagin, L.F., 3:45035
Evens, R.G., *See* Ter-Pogossian, M.M., 3:45382
Everitt, C.W.F., Feasibility analysis of gravitational experiments in space. Final report, 3:45467 (N—77-33223)
Evseenko, V.P., *See* Gudilin, I.A., 3:45987
Ewing, J.J., *See* Powell, H.T., 3:45172

F

Fabjan, C.W., *See* Cobb, J.H., 3:45559
Fabris, G., *See* Dunn, P.F., 3:44902
Fackler, O., *See* Barish, B.C., 3:45566
Fadeev, N.G., *See* Angelov, N., 3:45589
Fadeeva, E.I., *See* Muranova, G.A, 3:45062
Fadin, V.S., Processes with fermion exchange in nonabelian gauge theories, 3:45676
Faehl, R.J., Collective ion acceleration through temporal modulation of relativistic-electron-beam energy, 3:45871
Faesel, J., Sealing problems in solar collectors, 3:44556
Faikov, K., *See* Popov, A.B., 3:45752
Fairchild, R.C., *See* Frederick, J.R., 3:45223
Fairchild, R.G., Thermoluminescence of LiF TLD-100: Emission-spectra measurements, 3:45828
Thermoluminescence of LiF TLD-100: Glow-curve kinetics, 3:45829
Fan, L.S., Mathematical model for pyrolysis of a solid particle: effects of the heat of reaction, 3:44070
Fan, L.T., *See* Fan, L.S., 3:44070
Fanale, F.P., Report of the terrestrial bodies science working group. Volume 7. The Galilean satellites, 3:45477 (N—77-34080)
Fant, B.T., EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1—May 31, 1977, 3:44067 (FE—2353-17)
Farb, D., Information about hazardous waste management facilities, 3:44964 (PB—274881)
Farley, W.E., *See* Sidhu, G.S., 3:45826
Farmer, B.M., Annual environmental monitoring report: calender year 1977, 3:45316 (MLM—2515)
Farwick, D.G., *See* Johnson, R.N., 3:44695
Fassel, V.A., *See* Haas, J.W. Jr., 3:45112
Fedorov, V.I., *See* Gusakov, E.Z., 3:46018
Fedorov, V.L., *See* Mezentsev, A.P., 3:45514
Fedosejevs, R., *See* Richardson, M.C., 3:45930
Fedotov, S.I., *See* Basov, N.G., 3:46124
Fehlner, F.P., Solar heat pipe, 3:44534
Feick, G., Use of synthetic scavengers for the binding of heavy metals, 3:45355
Feinberg, F.L., Hamiltonian formulation of non-Abelian gauge fields and nonrelativistic bound states, 3:45594
Feldman, G.J., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602

Feldman, W.C., Long-term variations of selected solar wind properties: Imp 6, 7, and 8 results, 3:45456
See Burlaga, L.F., 3:45478
See Gosling, J.T., 3:45457
Feller, J.M., *See* Jaros, J.A., 3:45561
Felmlee, J.K., Determination of uranium in source rocks using radium in Crystal Springs, Great Salt Lake area, Utah, 3:44223 (USGS-CIRC—753, pp 48-50)
Femenia, J., *See* Lewis, E.V., 3:44953
Feng, T., *See* Ghosh, A.K., 3:44368
Fennelly, S.D., Chainless haulage systems for power loaders. Information circular as of April 1978, 3:44094 (FE—SFMP-1(78))
Fenton, C.A., *See* Kuhl, D.E., 3:45392
Ferguson, J.M., Particle-vibrator model for intermediate structure in neutron scattering from ^{56}Fe, 3:45719
Ferguson, R.L., *See* Plasil, F., 3:45746
Ferris, C.S.., Geochemical prospecting at the Ladwig uranium mine, near Golden, Colorado, 3:44232 (USGS-CIRC—753, pp 66-68)
Ferro-Luzzi, M., *See* Alston-Garnjost, M., 3:45583
Fessenden, T.J., *See* Lauer, E.J., 3:45993
Fetterman, H.R., Far-ir heterodyne radiometric measurements with quasioptical Schottky diode mixers, 3:45907
Fey, M.G., Low Cost Silicon Solar Array Project, Silicon Materials Task. Development of a process for high capacity arc heater production of silicon for solar arrays. Quarterly technical report, July—September 1977, 3:44357 (DOE/JPL/954589—3)
Fiedler, J., Present state of coking technology and development trends, 3:44024
Field, R.D., Can existing high—transverse-momentum hadron experiments be interpreted by contemporary quantum chromodynamics ideas, 3:45639
Filinov, V.S., *See* Biberman, L.M., 3:46021
Filip, H., *See* Kim, K.C., 3:45503
Filippas, T.A., *See* Cobb, J.H., 3:45559
Fill, E., *See* Hohla, K., 3:45212
See Witte, K., 3:45213
Finnemore, D.K., *See* Verhoeven, J.D., 3:45021
Finnis, M.W., *See* Clement, C.F., 3:44772
Firestone, A., *See* Chadwick, G.B., 3:45585
Firmin, G.H., *See* Martin, A., 3:44765
First, M.W., *See* Leith, D., 3:45240
Fischer, H.D., Managing innovation in newly established solar energy enterprises, 3:44350
Fischer, M., Experiences with heat recovery from waste water, 3:44922 (AED-Conf—1977-072-007)
Fisher, E.R., *See* Stephens, F.B., 3:45303
Fisher, P.W., Cryosorption pumping of deuterium by MS-5A at temperatures above 4.2 K for fusion reactor applications, 3:46131
Fishman, C., *See* Ghosh, A.K., 3:44368
Fisk, H.E., *See* Barish, B.C., 3:45566
See Merritt, F.S., 3:45569
Fisk, R.J., Correlations between two hadrons at large transverse momenta, 3:45575
Fitch, V.L., *See* Cester, R., 3:45576
Fitzgerald, W.D., *See* Fetterman, H.R., 3:45907
Flanagan, C.A., Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub—7117/25)
Flanigan, V.J., Surface geophysical methods applied to uranium exploration in crystalline terranes, 3:44238 (USGS-CIRC—753, pp 5-6)
Flatt, W., Supercompact jet filters in cyclone dimensions with optimum single-sleeve rinsing systems set new standards, 3:45237
Flatte, S.M., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Fletcher, G.L., *See* Payne, J.F., 3:45416
Fletcher, J.C., Apparatus for extraction and separation of a preferentially photo-dissociated molecular isotope into positive and negative ions by means of an electric field, 3:44258
Control for nuclear thermionic power source, 3:44774
Fletcher, R.D., Remote maintenance development, July 1, 1976—June 30, 1977, 3:45148 (ICP—1143)
Fleury, A., Statistical-model analysis of fission isomer production for /sup 237,235/Pu and ^{2}39Am, 3:45764
See Delagrange, H., 3:45763
Flewelling, F.J., Canadian experience with the reduction of mercury at chlor-alkali plants, 3:45313
Flicker, H., Measurement of 16-μm emission of a two-photon-excited ammonia laser, 3:45180
Flocard, H., Three-dimensional time-dependent Hartree-Fock calculations: Application to ^{16}O + ^{16}O collisions, 3:45695
Flora, B.S., Spacer capture rod to spacer grid attachment device, 3:44644
Floran, R.J, Silicate petrography and origin of the mesosiderites: a preliminary investigation of their relationships to the howardite-eurite-diogenite suite, 3:45434 (CONF-780314—2)
Flotow, H.E., *See* Lyon, W.G., 3:44998
Floyd, M.A., *See* D'Silva, A.P., 3:44213
Flusov, G.V., *See* Girich, B.G., 3:45186
Flyagin, V.B., *See* Amaglobeli, N.S., 3:45587
See Budagov, Y.A., 3:45590
Flynn, E.R., *See* Ajzenberg-Selove, F., 3:45705, 3:45742
See Sercely, R.R., 3:45692
Flynn, G.W., *See* Kleinman, L.I., 3:45522
Folkmann, F., *See* Christensen, P.R., 3:45745
Folomeshkin, V.N., Possible test of the PCAC hypothesis in neutrino reactions, 3:45625
Folomkin, I.P., *See* Burakov, V.S., 3:45917
Fomenko, V.N., *See* Savushkin, L.N., 3:45791
Fomenko, V.V., Effect of neutral injection on impurity diffusion in a collisional tokamak, 3:45970
Effect of neutral injection on particle diffusion and heat transfer under neoclassical conditions, 3:45971
Fomin, P.I., *See* Miranskii, V.A., 3:45675
Fonck, R.J., Atomic diamagnetism: Quasi Landau spectrum near the ionization threshold, 3:45509
Fong, A., *See* Jaros, J.A., 3:45561
Ford, E., Electricity from better batteries. Developments in the field of static energy sources in Great Britain, 3:44850
Ford, G.P., Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{66}Cu, 3:45717
Ford, J.L.C., *See* Gross, E.E., 3:45712
Ford, W.T., *See* Wanderer, P., 3:45570
Forestieri, A.F., Solar cell shingle, 3:44381
Forker, J.M., *See* Graham, K.F., 3:44651
Forster, H.P., *See* Bobleter, O., 3:44265
Fortin, X., *See* Bourdier, A., 3:46052
Fossum, J.G., High-efficiency p^+-n-n^+ back-surface-field silicon solar cells, 3:44363
See Neugroschel, A., 3:44365
Foster, C.A., *See* Spencer, D.L., 3:44478
Foster, C.R., Use of the dryer drum. Preprint 2843, 3:44957 (CONF-770448—2)
Foster, H.R., *See* Wilson, G.V.H., 3:45219
Fournier, G., *See* Bonnet, J., 3:45190
Fowler, E.C., *See* Cobb, J.H., 3:45559
Fowler, G.N., Effects of classical fields in meson correlations, 3:45659
Fowler, M.M., *See* Otto, R.J., 3:45759
Fowler, T.K., U. S. Mirror Fusion Program, 3:45895
Fox, K., *See* Cantrell, C.D., 3:45546
Fox, R.L., *See* Traeger, R.K., 3:44153
Fradkin, E.E., *See* Sokolov, V.A., 3:45201
Frank-Kamenetskii, A.D., *See* Timofeev, I.G., 3:44733
Franke, U., Increased output from open-cycle gas turbine plant using water/steam injection, 3:44618
Frankfurt, L.L., *See* Strikman, M.I., 3:45624
Franklin, M.E.B., *See* Caldwell, D.O., 3:45560
Franz, J.A., *See* Wiggins, D.J., 3:44302
Fraser, J.S., *See* Schriber, S.O., 3:45246
Frati, W., *See* Bahcall, J.N., 3:45453
Frederick, J.R., Improved ultrasonic nondestructive testing of pressure vessels. Progress report, October 1, 1976—September 30, 1977, 3:45223 (NUREG/CR—0135)
Freeman, M., Superconducting transmission: more power at half the cost, 3:44634
Freidberg, J.P., Rotational instabilities in a theta pinch, 3:46000
See Pearlstein, L.D., 3:46001
Freiesleben, H., *See* Christensen, P.R., 3:45745
Frejaville, G., *See* Beslu, P., 3:44654, 3:44655
French, H.T., *See* Bell, J., 3:45567
Frenkel', A.L., *See* Mikhailovskii, A.B., 3:46014
Friar, J.L., Charge asymmetry in ^{3}He-^{3}H and the neutron-proton mass difference, 3:45683
Nonlocal contributions to the rho-ω mixing charge-symmetry- breaking force, 3:45682
Friedberg, C.E., *See* Tanenbaum, W., 3:45602
Friedlander, G., *See* Bahcall, J.N., 3:45453
Friedman, A.M., *See* Ahmad, I., 3:45767
Friedrich, K., Fast power excursions in pebble-bed reactors: methods and results, 3:44822
Frigo, A.A., *See* Paddock, R.A., 3:45360
Fritz, I.J., Elastic properties of a lithia-alumina-silica glass-ceramic at high pressure, 3:45068
Fritz, P., *See* Jackson, T.A., 3:44209
Fritz-Niggli, H., *See* Blattmann, H., 3:45401
Froelich, D., *See* Schroeder, H.W., 3:45189
Froes, F.H., The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti—11.5Mo—6Zr—4.5Sn (beta III). Technical report, 3:45008 (AD-A—048773)
See Williams, J.C., 3:45007
Frohnholzer, J., Reservoirs for hydropower and improved pump-fed power stations in neighboring foreign countries, 3:44837
Frolov, V.M., *See* Mamaev, S.G., 3:45860
Frolov, V.V., *See* Andreev, N.E., 3:46016
Frost, R.C., Lightweight and cheap depth sampler, 3:44110
Frost, R.T., Laboratory studies of silicon vapor deposition, Phase A. Final report, 3:44359 (N—77-33296)
Fry, H., Method for comparing solar energy power systems for developing countries, 3:44397
Fugger, B., *See* Schroeder, H.W., 3:45189
Fuhrmann, J., Contact electrification of dielectric solids, 3:45085 (AED-Conf—1977-197-009)

Fujino, H., 6250 kVA superconducting generator, 3:45140 (NP—23197)
Fujisawa, N., *See* Sugawara, T., 3:46102
Fujita, J., *See* Mohri, A., 3:46107
Fujita, M., *See* Shirotani, T., 3:45403
Fujiwara, M., Helically symmetric equilibrium of current-carrying finite beta plasma, 3:45948 (N—77-33987)
See Fujiwara, M., 3:45948
Fukumasa, O., Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system, 3:46040 (N—77-34003)
Fukumura, T., Plasma acceleration by means of microwave radiation pressure, 3:45944
Funahashi, A., *See* Itagaki, T., 3:45901
See Matoba, T., 3:45902
See Sugawara, T., 3:46102
Fung, P.C.W., Equation of polarization transfer in an inhomogeneous magnetized plasma. II. Solutions, 3:46054
Non-linear scattering probability of longitudinal plasma waves in a magnetoactive plasma system, 3:46055
Funke, W., Roller cutting machine, 3:44107
Furumoto, A.B., *See* Keller, G.V., 3:44570
Furuta, K., *See* Tsubosaka, A., 3:44792
Furutani, Y., *See* Khiet, T., 3:46037

G

Gabathuler, K., *See* Preedom, B.M., 3:45689
Gabbe, D., *See* Weber, M.J., 3:45090
Gabriel, C., *See* Pietrafesa, L.J., 3:45436
Gackowska, G., *See* Nowicki, M., 3:45191
Gadomski, A., *See* Blenski, T., 3:44735
Gaentzsch, G., Solar energy systems from the point of view of the building inspector, 3:44352
Gaertner, R., 380 kV cable in Berlin, 3:44630 (AED-Conf—76-407-006)
Gage, S.J., Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB—274107)
Galaiko, V.P., *See* Bezuglyi, E.V., 3:45048
Galaktionov, E.V., *See* Bulyginskii, D.G., 3:45898
Galitskii, V.M., Relaxation of pion fields in nuclear matter, 3:45790
Gallmann, A., *See* Coffin, J.P., 3:45703
Galloway, T.R., *See* Lyczkowski, R.W., 3:44054
Galushka, A.P., Electron spin resonance in CdS:Mn single crystals irradiated with ^{60}Co γ rays, 3:45105
Gamble, R., Simulation of a solar-assisted and open cycle cooling system using air as the transport medium, 3:44431 (CONF-761220—, pp 309-314)
Gans, D. Jr., Subatmospheric double containment system, 3:44823
Garcia-Tello, P., *See* Colwell, R.R., 3:45409
Gardner, W.L., *See* Whealton, J.H., 3:46103
Garland, M., *See* Snapp, P.C., 3:44645
Gartling, D.K., *See* Stone, C.M., 3:44813
Gary, S.P., Density gradient drift instabilities: Oblique propagation at zero beta, 3:45999
Electromagnetic ion beam instability and energy loss of fast alpha particles, 3:46008
See Lemons, D.S., 3:45488
Gasnikov, N.K., *See* Abagjan, A.A., 3:44769
Gates, S.J. Jr., Geometry of superspace and local supersymmetry, 3:45858
Gatschke, W., *See* Braetter, P., 3:45108
Gauguin, R., Thermally stable carriers, 3:44987
Gauster, W.B., Study of radiation damage in metals by positron annihilation, 3:45059
Gauthier-Lafaye, F., Geological follow-up of the mining of the natural reactors of Oklo, 3:44210 (LA-tr—78-26)
Gavrilov, N.M., *See* Polovov, V.M., 3:45041
Gavron, A., *See* Britt, H.C., 3:45776
Gawlik, D., *See* Braetter, P., 3:45108
Gazzaly, M.M., *See* Nasser, M.A., 3:45573
Geaga, J.V., *See* Nasser, M.A., 3:45573
Geballe, T.H., *See* Chin, G.Y., 3:45016
Geesaman, D.F., *See* Davids, C.N., 3:45721
See Paul, M., 3:45716
See Tabor, S.L., 3:45714
See Zeidman, B., 3:45700
Geiger, B., *See* Schaefer, H., 3:44917
Geiger, J.F., Assessment of Hanford burial grounds and interim TRU storage, 3:44292 (RHO-CD—78(Rev.))
Geilikman, B.T., Raman sound scattering in normal metals and superconductors, 3:45848
Gekelman, W., Characterization of a laser-produced negative-hydrogen-ion plasma, 3:45911
Gellert, D.P., Process of and apparatus for solar heating and the like, 3:44444
Gemmell, D.S., *See* Schiffer, J.P., 3:45558
George, E.P., *See* Wilson, G.V.H., 3:45219
Geosling, C.E., Enrichment of hydrogen isotopes using the low-temperature glow-discharge technique, 3:44321
Gerberich, W.W., Analysis of the ductile-brittle transition temperature in Fe-binary alloys. Final report, May 1974—July 1977, 3:45015 (TID—28431)
Germogenova, T.A., *See* Abagjan, A.A., 3:44769, 3:45824
Gernhardt, P., *See* Grams, W., 3:44026
Gershtein, S.S., *See* Baranov, D.S., 3:45571
Gesewsky, P., *See* Riedel, H., 3:45318
Ghosh, A.K., SnO_2/Si solar cells: heterostructure or Schottky-barrier or MIS-type device, 3:44368
Giacomelli, G., *See* Carrigan, R.A. Jr., 3:45578
Gibbons, J.F., Solar cell made of semiconductor material, with method of production, 3:44383
Gibbs, A., Computerized radionuclidic analysis in production facilities, 3:45111 (DPSPU—77-30-10)
Gibson, B.F., *See* Friar, J.L., 3:45682, 3:45683
Gibson, E.D., *See* Verhoeven, J.D., 3:45021
Gibson, G., *See* Chapin, D.L., 3:46084
Gidal, G., *See* Scharre, D.L., 3:45581
Gidaspow, D., *See* Lyczkowski, R.W., 3:44054, 3:44820
Gilai, D., Optimal iron-water shields for fusion reactors, 3:46094
Gilerson, V.B., *See* Amus'ya, M.Y., 3:45538
Gilfillan, E.S., *See* Mayo, D.W., 3:45333
Gillen, K.T., Rotating frame NMR relaxation study of gaseous ClF, 3:45494
Gillespie, G.H., Born cross sections for ion-atom collisions, 3:45535
Gilligan, J.G., Multigroup calculations of low-energy neutral transport in tokamak plasmas, 3:45960
Girich, B.G., Laser Pb/sub 1hyphenx/Sn/sub x/Te heterostructures, 3:45186
Gismatullin, Y.R., *See* Berdnikov, Y.A., 3:45710
Gladd, N.T., *See* Davidson, R.C., 3:46003
Glaessel, P., *See* Wozniak, G.J., 3:45760
Glanz, W., Bunkering and storing coal for large power plants, 3:44129
Glasby, H., Longwall mining, 3:44109
Glashausser, C., *See* Hoffman, G.W., 3:45702
Glass, G., *See* Riley, P.J., 3:45704
Glavish, H.F., *See* Hennies, D., 3:45502
Glazer, S., Collection and evaluation of salt mixing data with the real time data acquisition system, 3:44689 (COO—2245-36TR)
Gleason, V.E., *See* Boyer, J.F., 3:44087
Glebova, N.A., *See* Elenskii, F.Z., 3:44027
Glenn, L.A., BWR pool dynamics in a loss of coolant accident. Calculation of the air-venting phase, 3:44818 (UCRL—52435)
Glogg, P., *See* Hess, W., 3:44988
Glueck, M., Gluon contribution to hadronic J/psi production, 3:45626
Glynn, K.P., Solar energy operated motor apparatus, 3:44511
Gnugesser, E., Illumination also needs energy. Measures for rational and economical uses of illumination energy, 3:44950
Gobbi, B., *See* Jaros, J.A., 3:45561
Gober, W.E., *See* Steinman, D.K., 3:44235
Godfrey, B.B., *See* Faehl, R.J., 3:45871
Godfrey, W.L., *See* Anderson, R.T., 3:44275
Godovikov, S.K., *See* Bogdanov, P.V., 3:45051
Godrick, J.A., Method of fabricating a solar heating unit, 3:44524
Godwin, R.P., *See* Mitchell, K.B., 3:45909
Goeser, D.K., *See* Nolan, J.E., 3:44688
Goitein, M., *See* Boyd, D.P., 3:45273
Gol'dberg, V.Z., *See* Artemov, K.P., 3:45713
Gol'dshtein, V.A., *See* Kuplennikov, E.L., 3:45709
Goldberg, M., *See* Cobb, J.H., 3:45559
Golden, D.M., *See* Barker, J.R., 3:45298
Golden, J., Intense proton-beam-pumped Ar-N_2 laser, 3:45170
See Marsh, S.J., 3:45882
See Pasour, J.A., 3:45500
Goldhaber, A.S., Electric and dynamic quadrupole moments of even-even nuclei, 3:45781
Volume versus surface sampling of Maxwellian distributions in nuclear reactions, 3:45793
See Amsden, A.A., 3:45762
Goldhaber, G., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Goldhaber, M.B., *See* Reynolds, R.L., 3:44219
Goldhammer, L.J., ATS-6 solar cell experiment/improvement. Final report, 1 January—31 December 1976, 3:44393 (N—77-33607)
Goldman, L.H., Neutron borehole logging correction technique, 3:45278
Goldstein, N.E., Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL—6815)
Goldstein, S.A., *See* Mosher, D., 3:45933
Goldstone, P., *See* Ogle, W., 3:45266
Goldstone, P.D., *See* Britt, H.C., 3:45776
See Plasil, F., 3:45746
Golenetskii, S.I., Travel time curves of seismic waves for the southern Baikal region, 3:45429 (UCRL-Trans—11368)
Golyaev, Y.D., Mode pulling in a neodymium garnet laser, 3:45195
Gomez, M.F., *See* Miller, W.F. Jr., 3:44734
Goncharov, N.I., Electric field of a laser spark ignited near a conducting target, 3:45985
Gonsiorawski, R., Anti-reflective coating for silicon solar cells, 3:44372
Gonzalez, E.E., Solar energy device, 3:44542
Gonzalez, R.C., *See* Mitchell, R.J., 3:44732
Good, M.L., *See* Fisk, R.J., 3:45575

Goodman, B.L., *See* Adams, C.E. Jr., 3:45352
Goodrich, L.F., *See* Verhoeven, J.D., 3:45021
Gopal, R., *See* Graham, K.F., 3:44775
Gorbunov, L.M., *See* Sauer, K., 3:46065
Gordeev, A.V., Transition to the electron tearing mode, 3:46027
Gordon, D.C. Jr., Importance of sediment working by the deposit-feeding polychaete Arenicola marina on the weathering rate of sediment-bound oil, 3:45413
Gordon, R.S., Impurity effects on the creep of polycrystalline magnesium and aluminum oxides at elevated temperatures. Technical progress report, December 19, 1976—December 18, 1977, 3:45065 (COO—1591-32)
Gorelenok, A.T., *See* Alferov, Z.I., 3:45194
Goren, Y., Nonlinear development of the negative-mass instability and its effect on intense microwave generation, 3:45996
See Davidson, R.C., 3:46003
Gorin, Y.P., *See* Antipov, Y.M., 3:45586
Gosling, J.T., Solar wind stream interfaces, 3:45457
See Feldman, W.C., 3:45456
See Palmer, I.D., 3:45455
Gosteva, T.S., Return-current amplification in the interaction of an intense relativistic electron beam with a gas target, 3:45940
Gotow, K., *See* Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Gottfried, K., *See* Low, F.E., 3:45628
Gou, H.C., *See* Popov, A.B., 3:45752
Gould, C.R., *See* Weller, H.R., 3:45727
See Wender, S.A., 3:45706
Gould, R.W., *See* Levine, B., 3:45868
Gove, N.B., *See* Bertini, H.W., 3:45641
Govorov, A.M., *See* Alfimenkov, V.P., 3:45690
Grach, I.L., Dispersion approach to the calculation of three-particle bound states and contributions of three-particle unitarity, 3:45677
Grach, S.M., *See* Bespalov, P.A., 3:46022
Gradov, O.M., Excitation of ion—acoustic waves in an inhomogeneous plasma by a train of rf pulses, 3:46068
Graham, K.F., Method and apparatus for monitoring the axial power distribution within the core of a nuclear reactor, exterior of the reactor, 3:44775
N-16 Transit Time Flow Measurement System (TTFM) description and performance, 3:44651 (WCAP—9264)
Gralnick, S.L., *See* Gilligan, J.G., 3:45960
Gramm, R.J., Solar heating and insulating apparatus, 3:44545
Grams, W., Equipment to carbonize fine-grained fuels, 3:44026
Grandjean, F., *See* Lyon, W.G., 3:44998
Granger, H.C., *See* Leventhal, J.S., 3:44251
Grapanovich, L.N., Slice working of thick seams as a function of rock pressure, 3:44114
Grasberger, W.H., *See* Post, D.E., 3:45965
Grauch, R.I., *See* Reynolds, R.L., 3:44219
Graulier, M., *See* Gauguin, R., 3:44987
Graves, G.V., *See* Tai, C.Y., 3:44029
Grawe, J., Promotion of solar technology in Baden-Wuerttemberg, 3:44885
Gray, L.W., Recovery of plutonium from carbon analysis residues, 3:45115 (DP—1495)
Green, A.C., Report on the development of a model energy conservation program for New York State schools. Report on phase 1, January—July 77, 3:44948 (PB—274285)
Green, D.C., *See* Sullivan, R.F., 3:44065, 3:44208
Green, S., Collisional excitation of interstellar molecules: H_2, 3:45537
Green, T.A., Configuration interaction studies of the HeH^+ molecular ion. IV. The triplet sigma, pi, and delta states, 3:45506
Greene, G.J., *See* Levine, B., 3:45868
Greenspan, E., *See* Gilai, D., 3:46094
Grefen, K., Issuing of guidelines - role and activities of the VDI Kommission Reinhaltung der Luft, 3:45307
Gregg, D.W., *See* Aiman, W.R., 3:44056
Gregor, K., Coking furnace, 3:44025
Greiner, D.E., *See* Heckman, H.H., 3:45572, 3:45688
Grekova, L., *See* Angelov, N., 3:45589
Grekova, L.D., *See* Angelov, N., 3:45588
Grenier, R.P., Halftone display, particularly for a high resolution radioactivity distribution detection system, 3:45260
Grether, D., *See* Chadwick, G.B., 3:45585
Grewal, N.S., *See* Saxena, S.C., 3:45231
Griffin, J.A., *See* Weber, M.J., 3:45090
Griffin, P.M., *See* Vane, C.R., 3:45534
Griffiths, J.E., *See* Gillen, K.T., 3:45494
Grigoryan, E.O., *See* Asaturyan, V.M., 3:45563
Grigoryan, L.S., Presence of π^- mesons in heavy atomic nuclei, 3:45761
Grimes, P.G., *See* Ciprios, G., 3:44908, 3:44909
Grimm, U., *See* Mei, J.S., 3:44134
Grisaru, M.T., *See* Abbott, L.F., 3:45667
Grise, F.G.J., Conservation of electrical energy, 3:44621
Grishaev, V.I., Parametric excitation of nonlinear longitudinal waves in a magnetized plasma by an inhomogeneous electromagnetic field, 3:46028
Grisham, L.R., Free-expansion experiment on ATC, 3:45937
See Whealton, J.H., 3:45250
Grishin, V.G., *See* Angelov, N., 3:45589
Grishin, V.K., Charge and current neutralization in the injection of an electron beam into a bounded waveguide containing a magnetized plasma, 3:45969
Gronlund, W.D., *See* McCain, B.B., 3:45377
Gross, D.J., *See* Callan, C.G. Jr., 3:45666
Gross, E.E., ^{20}Ne nuclear moments from ^{20}Ne(131 MeV) + ^{208}Pb scattering, 3:45712
See Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Gross, S., Review of electrochemical impregnation for nickel/cadmium cells, 3:44852 (N—77-33601)
Grosse, E., *See* Guidry, M.W., 3:45748
Grossman, G., *See* Dabiri, A., 3:44479
Grossmann, W., End loss reduction in linear devices by means of oscillating multiple mirrors, 3:45872 (IPPJ—285)
Grotta, H.M., *See* Berry, D.A., 3:44066
Gruenhoff, H., Large heat storage tanks of double-walled, foam-insulated design, 3:44842
Gruhn, C., *See* Ogle, W., 3:45266
Grundfelt, B., Geosphere model: description, opinions, and input requirements, 3:45359 (BNWL-tr—268)
Grupp, H., *See* Buishvili, L.L., 3:45681
Grusha, G.V., *See* Amirkhanov, I.V., 3:45674
Grushetskii, A.V., *See* Golyaev, Y.D., 3:45195
Gudilin, I.A., Absorption of laser radiation in the deionization stage of a laser spark, 3:45987
Guersey, F., Spontaneous symmetry breaking and nonlinear invariant Lagrangians: Applications to SU(2) x U(1) and OSp(1/4), 3:45646
Guidry, M.W., Coulomb-nuclear interference for high-spin states excited by ^{86}Kr, ^{40}Ar, and ^{16}O projectiles, 3:45748
See Sayer, R.O., 3:45750
Gupalo, M.S., Adsorption of lanthanum on the (100) face of a tungsten single crystal, 3:45036
Gupta, R.K., Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
Gureev, D.M., *See* Girich, B.G., 3:45186
Gurnett, D.A., Electromagnetic plasma wave emissions from the auroral field lines, 3:45483 (N—77-33387)
Gusakov, E.Z., Decay of an electromagnetic wave into two plasmons in an inhomogeneous plasma, 3:46018
Generation of (3/2) ω_0 in a laser-produced plasma, 3:46058
Gusev, N.Z., Kinetics of the thermal decomposition of coal under nonisothermal conditions, 3:44071
Gust, D., System for applied digestion of information about solar technology, 3:44353
Gutbrod, H.H., *See* Plasil, F., 3:45746
Guth, E.D., Method to desulphurize coal, 3:44032
Guthrie, M.P., *See* Bertini, H.W., 3:45641
Gverdtsiteli, I.G., Cesium—bismuth thermionic converter, 3:44905
Gvozdic, N., *See* Patel, V.M., 3:45125
Gwin, R., Measurements of the average number of prompt neutrons emitted per fission of ^{239}Pu and ^{235}U, 3:45773 (ORNL/TM—6246)
Review and combination of experimental results for neutron emission per fission of ^{232}Th, 3:45772 (ORNL/TM—6245)

H

Haas, J.W. Jr., Specifications for an inductively coupled plasma simultaneous multielement analysis system, 3:45112 (IS—4353)
Haas, W.J. Jr., *See* D'Silva, A.P., 3:44213
Haber, I., Slope reversal of a monotonically decreasing electron tail in a strong magnetic field, 3:46004
Habourdin, P., Optimal choice and conditions for the use of tires in mines, quarries, public works, and civil engineering, 3:44112
Hack, W.L., *See* Bunn Jr., 3:44165
Haeberli, W., *See* Hennies, D., 3:45502
Hagelstein, P.L., Solution of a second-order integro—differential equation which occurs in laser modelocking, 3:45867
Hagiwara, T., *See* Budny, R., 3:45603
Hahn, A.A., *See* Wang, K., 3:45511
Hajdu, J., Solar collector having selective film of improved stability to liquid water condensate, 3:44520
Hale, G.L., Environmental considerations for low-Btu gasification of coal for electric power generation, 3:44037 (FE—1545-44)
Halm, H.J., Econocrete. Preprint 2845, 3:44956 (CONF-770448—3)
Halow, J.S., *See* Mei, J.S., 3:44134
Halperin, J., Nuclear Data Sheets for A=199, 3:45756
Halter, A.N., *See* Browne, T.E., 3:44876
Halzen, F., Can the Fermi motion of partons recover canonical scaling in hadronic high-p/sub T/ processes, 3:45638

Testing quantum chromodynamics in the hadroproduction of real and virtural photons, 3:45669
Ham, D.G., *See* Moore, R.H., 3:44031
Hamada, Y., *See* Fujiwara, M., 3:45948
Hammer, D., *See* Viehboeck, F.P., 3:44418
Hammer, D.A., *See* Book, D.L., 3:46098
Hammer, D.I., Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis, 3:45422 (PB—274339)
Hammer, O., Short course on solar technology for heating and plumbing tradesmen, 3:44345
Hammerling, P., *See* Campbell, P.M., 3:46116
Hampicke, U., CO_2 risk. Change in climate by increasing combustion within the next decades, 3:45309
Hampson, G.R., No. 2 fuel oil spill in Bourne, Massachusetts: immediate assessment of the effects of marine invertebrates and a 3-year study of growth and recovery of a salt marsh, 3:44182
Hancock, O.G., *See* Beach, C.D., 3:44423
Hanft, R., *See* Bell, J., 3:45567
Hanks, R.W., *See* Smoot, L.D., 3:44047
Hann, P.D., *See* Chapman, C.C., 3:44163
Hansen, O., *See* Ajzenberg-Selove, F., 3:45705
See Christensen, P.R., 3:45745
Hansen, S.F., *See* Burlaga, L.F., 3:45478
Hanser, F.A., Total ozone derived from uv spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights. Final report, 3:45479 (N—77-33684)
Hanson, D.L., *See* Ajzenberg-Selove, F., 3:45742
Hanson, G., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Hanson, K.M., *See* Bebek, C.J., 3:45562
Hanson, S.A., *See* Mayo, D.W., 3:45333
Happ, H.J. III, *See* Lunn, P.W., 3:45283
Hara, S., *See* Kawamoto, T., 3:44299
See Terai, R., 3:44300
Hara, T., Nonlinear development of the current-driven ion wave instability, 3:46031
Hardesty, D.R., Rates and mechanisms of pulverized coal combustion. First annual report, 3:44136 (SAND—78-8234)
Hardie, G., *See* Meyer-Schuetzmeister, L., 3:45722
Hardy, R., *See* Mackie, P.R., 3:44178
Hariharan, P.C., *See* Binkley, J.S., 3:45544
Harker, Y.D., Fission product and reactor dosimetry studies at Coupled Fast Reactivity Measurements Facility, 3:44785 (TREE—1259)
Harland, J.R., Research on cross-flow filtration for solids removal from coal syncrudes. Final report, 3:44061 (FE—2245-16)
Harlow, F.H., *See* Amsden, A.A., 3:45762
Harms, K., Alaska oil starts flowing, 3:44188
Harnett, R.M., *See* Hester, J.C., 3:44457
Harper, C., Coal gasification valves: Phase II. Quarterly technical progress report, September 1977—November 1977, 3:44042 (FE—2355-2(Rev.E))
Harrington, W., Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB—273847)
Harris, F.A., *See* Bell, J., 3:45567
Harris, R.A., *See* Ombrellaro, P.A., 3:44780
Harrison, E.A., Medical information systems (a bibliography with abstracts). Report for February 1964—December 1977, 3:45385 (NTIS/PS—78/0031)
Harrison, F.L., Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID—17744-78-2)
Harrison, R.J., Self-operating chemical feeder for an oil well, 3:44155
Harrison, W., Water resources research program. Pollution of coastal waters off Chicago by sinking plumes from the Indiana Harbor Canal, 3:45327 (ANL/WR—77-2)
Harrison, W.E., Experimental diagenetic study of a modern lipid-rich sediment, 3:44146
Hart, R.G., Management of nuclear waste, 3:44288 (AECL—5800, pp 69-79)
Harter, D.G., Solar heating, 3:44543
Hartzman, P.D., Configurable software for satellite graphics, 3:46136 (COO—3077-148)
Harvey, C.E., Financing public expenditures for energy-impacted roads, 3:44125 (PB—274405)
Hasegawa, K., Rotor for a rotary electrical machine having a superconductive field winding, 3:45144
Haselton, H.H., *See* Whealton, J.H., 3:46103
Hastings, I.J., *See* Schankula, M.H., 3:44777
Hastwell, P.J., Thermal panel for heating liquids, 3:44541
Hatami, R., Solar heated absorption refrigeration system, 3:44497 (CONF-761220—, pp 285-287)
Hatcher, S.R., Prospects for future CANDU fuel cycles, 3:44667 (AECL—5800, pp 87-94)
Hathaway, L.R., Interpretation of uranium content of ground water in west-central Kansas, 3:44231 (USGS-CIRC—753, pp 65-66)
Hatori, I., *See* Obayashi, H., 3:45888
Hatori, T., Real-space quasilinear theory of drift in a sheared magnetic field, 3:45949 (N—77-33994)
See Nishi-kawa, K.I., 3:45950
Hattner, R., *See* Perez-Mendez, V., 3:45254
Hattori, T., Additional air control device for an internal combustion engine, 3:44974
Air-to-fuel ratio controlling system for internal combustion engines, 3:44978
Engine air-to-fuel ratio control system, 3:44976
Haustein, P.E., *See* Cumming, J.B., 3:45733
Hawke, R.S., Electrical properties of Al_2O_3 under isentropic compression up to 500 GPa (5 Mbar), 3:45089
Hawkes, J.W., *See* McCain, B.B., 3:45377
Hay, P.J., *See* Dunning, T.H. Jr., 3:45174
Hayakawa, M., Geothermal energy, 3:44578 (CONF-7608107—1)
Hayami, H., Rock drilling and crushing methods: congealing crush of hot dry rock, 3:44595 (CONF-770754—1)
Hayashi, T., *See* Kadoya, S., 3:44285
Hayet, L., *See* Lefort, G., 3:45151
Haynes, H.W. Jr., Mass transport characteristics of zeolite cracking catalysts. Quarterly report, September 30—December 31, 1977, 3:44068 (FE—2727-1)
Hays, A.K., *See* Tellinghuisen, J., 3:45175
Hazeltine, R.D., Variational theory of drift and tearing eigenmodes in slab geometry, 3:45997
Hazi, A.U., *See* Rescigno, T.N., 3:45496
Head, H.N., EPA alkali scrubbing test facility: advanced program. Progress report No. 3, February—November 1976, 3:44625 (PB—274544)
Hearst, J.R., *See* Swift, R.P., 3:45076
Hecht, H.G., *See* Boring, M., 3:45507
Heck, J.L., *See* Suchomel, R.R., 3:44261
Heckler, R., *See* Reents, H., 3:44881
Heckman, H.H., Central collisions produced by relativistic heavy ions in nuclear emulsion, 3:45572
Fragmentation of ^{4}He, ^{12}C, ^{14}N, and ^{16}O nuclei in nuclear emulsion at 2.1 GeV/nucleon, 3:45688
Hedden, R.E., *See* Parker, A.J. Jr., 3:44415, 3:44438
Hedman, P.O., *See* Smoot, L.D., 3:44047
Heestand, R.L., *See* Copeland, G.L., 3:44282
Heffner, R.H., *See* Burman, R.L., 3:45697
Hehn, G., *See* Caglioti, E., 3:45817
Hehre, W.J., *See* Binkley, J.S., 3:45544
Heikkila, W.J., Electric field topology near the dayside magnetopause, 3:45486 (N—77-33737)
Heins, C.F., Solar heating system for recreation building at Scattergood School, 3:44440 (DOE/NASA/CR—150553)
Heinzel, F., Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr—77-72)
Heisenberg, J., *See* Lichtenstadt, J., 3:45758
Heitz, E., Utilization of thermal energy in the plastic industry, 3:44962
Hellmeister, H.P., Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
Helms, C., *See* Sherman, F., 3:45373
Hemphill, J.B., *See* Noble, J.B., 3:44712
Henderson, T.D., Solar energy collecting apparatus, 3:44527
Henderson, T.M., Cryogenic microshell pellets and other advanced targets for laser fusion, 3:44318
Hendricks, C.D., *See* Weinstein, B.W., 3:46129
Hennies, D., Production of polarized H^- or D^- ions by a colliding-beam method, 3:45502
Henning, W., Optimum Q value in heavy-ion-induced neutron transfer at the Coulomb barrier, 3:45740
See Paul, M., 3:45716
See Rehm, K.E., 3:45725
See Tabor, S.L., 3:45714
Henriques, F.C., Solar heat collector, 3:44548
Hensel, W., Power supply with flywheel storage, 3:44840
Hensen, L.F., *See* Sidhu, G.S., 3:45826
Hensley, D.C., *See* Gross, E.E., 3:45712
Henyey, F.S., *See* Celmaster, W., 3:45592
Herb, S.W., *See* Fisk, R.J., 3:45575
Herbert, M.L., Measurement of $\Sigma^- \rightarrow \Lambda e^-$ and $\Xi^- \rightarrow \Lambda e^- \nu$ branching ratios, 3:45568
Herbert, W., *See* Baron, G., 3:44335
Hercher, M., Efficient intracavity laser Raman spectrometer, 3:45181
Hermann, O.W., *See* Bertini, H.W., 3:45641
Herquet, P., *See* Chadwick, G.B., 3:45585
Herrnberger, V., *See* Caglioti, E., 3:45817
Hertz, J.A., Critical dynamics of a Heisenberg spin-glass, 3:45834
Herziger, G., Collimated soft X-rays from the plasma focus, 3:45936
Hess, G., Structure and method of operation of the section 'bibliography, documentation' and its importance for the research work of the Tremonia experimental mine, 3:46147
Hess, W., Waste gas control in cars as an active contribution to environmental protection, 3:44988
Hesser, J.E., *See* Warren, W.H. Jr, 3:45439
Hessler, J.P., *See* Caird, J.A., 3:45162

Hester, J.C., Process water heating by solar augmentation for the textile industry, 3:44457 (CONF-761220—, pp 189-190)
Hester, R.E., *See* Lauer, E.J., 3:45993
Heusch, B., *See* Coffin, J.P., 3:45703
Heusch, C.A., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Heyde, K., Unified description of odd-mass indium nuclei I. General theory and comparison to ^{113}In and ^{115}In levels populated in the decay of ^{113}Sn and ^{115}Cd/sup m/,g, 3:45737
Hibbard, F.H., Tables of ionospheric electron contant hourly values for Armidale, Australia for the period May 1970 through June 1975. Final report, 1 July 1973—30 July 1975, 3:45480 (AD-A—047287)
Hiebert, J., *See* Riley, P.J., 3:45704
Higgins, C.S., *See* Phelps, M.E., 3:45383
Hilbert, K.D., Solar publicity - wishes and realities, 3:44859
Hildebrandt, R., Development of primary energy consumption since 1860, 3:44919
Hill, J.C., *See* Shih, L.L., 3:45739
Hill, R.M., *See* Kligler, D., 3:45173
Hill, R.W., *See* Aiman, W.R., 3:44056
Hillenbrand, L.J., *See* Berry, D.A., 3:44066
Hillhouse, D.L., Prototype field calibration system for coupling capacitor voltage transformers (CCVTs). Final report, 3:44631 (EPRI-EL—690)
Hills, F.A., Origin of uranium in the middle Precambrian Estes Conglomerate, Eastern Black Hills, South Dakota: inferences from lead isotopes, 3:44243 (USGS-CIRC—753, pp 15-17)
Hilton, H.H., *See* Paulikas, G.A., 3:45485
Hinnov, E., *See* Suckewer, S., 3:45935
Hintz, N.M., *See* Hoffman, G.W., 3:45702
Hirabayashi, J., *See* Takaesu, K., 3:44588
Hirano, K.I., End pluggings of a linear theta pinch by hot high z plasmas of high mass number, 3:45873 (N—77-33979)
Hiroha, K., *See* Kawamoto, T., 3:44299
Hirshman, S.P., Neoclassical current in a toroidally-confined multispecies plasma, 3:45953
Hittle, D.C., The building loads analysis and system thermodynamics (BLAST) program. Volume I. User's manual. Final report, 3:44921 (AD-A—048734)
Hodgins, H.O., *See* McCain, B.B., 3:45377
Hodgkinson, D.R., Pump-packing systems at Florence Colliery, 3:44103
Hoekstra, J., *See* Lester, G.R., 3:44989
Hoelter, H., Method and device for cleaning underground cavities, especially in bituminous coal mining, 3:44120
Hoenig, A., Fresh concrete control in situ of biological shields of nuclear reactors, 3:44768
Hoffman, A.L., Axial laser heating of small-diameter theta-pinch plasmas, 3:45876
Hoffman, E.J., *See* Phelps, M.E., 3:45383
Hoffman, G.W., Analyzing power in proton-nucleus elastic scattering at 0.8 GeV, 3:45702
Hoffman, J.M., *See* Tellinghuisen, J., 3:45175
Hoffmann, E., Rod-shaped probe for soaking minerals to be mined, especially coal in mining, 3:44119
Hofstetter, E.M., *See* Strehler, A., 3:44339
Hogan, J.T., *See* Grisham, L.R., 3:45937
Hohla, K., Prospects of the high power iodine laser, 3:45212
See Witte, K., 3:45213
Hoisington, W.D., *See* Dooley, J.R. Jr., 3:44249
Hoistad, B., *See* Nasser, M.A., 3:45573
Holland, R.E., Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
Holland, R.F., *See* Flicker, H., 3:45180
See Kim, K.C., 3:45503
Hollenack, W.R., *See* Lewis, H.E., 3:44062, 3:44063
Hollowell, C.D., *See* Berk, J.V., 3:44938
Hollstein, E.J., *See* Schneider, A., 3:44064, 3:44069
Holmes, S.D., *See* Bebek, C.J., 3:45562
Holroyd, R.A., Correspondence of conduction band minima and electron mobility maxima in dielectric liquids, 3:44999
Holt, F.S., Wide angle solar heat collection system, 3:44544
Holt, R.J., *See* Burman, R.L., 3:45697
Holt, S.S., *See* Mushotzky, R.F., 3:45451
Holtzscheiter, E.W., Safety methodology for space nuclear systems. Final report, 3:44324 (AD-A—048780)
Hom, D.C., *See* Fisk, R.J., 3:45575
Homberg, O.A., *See* Singleton, A.H., 3:45236
Hones, E.W. Jr., Processes at the magnetotail baoundary: Comments on 'On hot tenuous plasmas, fireballs, and boundary layers in the earth's magnetotail' by L. A. Frank, K. L. Ackerson, and R. P. Lepping, 3:45487
Honeycutt, T.C., *See* Delaney, J.B., 3:44711
Honke, H., *See* Funke, W., 3:44107
Honzawa, T., Experimental study on self-modulation of ion plasma oscillations, 3:45551 (N—77-33995)
Hooks, H.W., *See* Lewis, H.E., 3:44062, 3:44063
Hoop, B. Jr., *See* Budinger, T.F., 3:45393
Hoover, L.J., Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213—11)
Hopke, P.K., *See* Meyer, R.A., 3:45730
Hopkins, F., *See* Jamison, K.A., 3:45532
See Matthews, D.L., 3:45510
Hopkins, G.R., Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL—13801)
Hopman, H.J., *See* Sinman, A., 3:45900
Hora, H., *See* Schwarz, H.J., 3:46119
See Wilson, G.V.H., 3:45219
Horikawa, Y., *See* Arima, A., 3:45693
Horn, J., Relation between energy - ecology - economy. An investigation with examples from Brazil and other Third World countries, 3:44858
Hornak, L.P., *See* Shallenberger, J.M., 3:44762
Horner, M.H., *See* Carpenter, F.D., 3:46086
Horowitz, A., *See* Atlas, R.M., 3:44176
Horowitz, Y.S., *See* Dubi, A., 3:45821
Horton, W. Jr., Toroidal mode coupling effects on drift wave stability, 3:45994
Horwitz, N., *See* Cobb, J.H., 3:45559
Hovingh, J., *See* Hopkins, G.R., 3:46127
Howard, J.E., Mirror-damage thresholds for laser-fusion pulse shapes, 3:46128
Howden, M.G., Microspheres containing Nay zeolite synthesized from a South African kaolinite. (Precursor for a fluidized bed cracking catalyst), 3:44158 (PB—274450)
Hoyt, E.W., *See* Dean, N.R., 3:45251
Hsu, C.S., *See* Patel, V.M., 3:45125
Huang, B.K., Solar curing and drying structure and method of utilizing solar energy associated with available solar radiation in curing and drying various materials, 3:44474
Huba, J.D., *See* Haber, I., 3:46004
Hubbard, S.E., Solar energy collector panel, 3:44535
Hubbard, W.N., *See* Lyon, W.G., 3:44998
Huber, J.G., *See* Sereni, J.G., 3:45028
Huebel, J.G., *See* Hawke, R.S., 3:45089
Huebner, R., Hydrogen - energy carrier of the future, 3:44325
Huestis, D.L., *See* Kligler, D., 3:45173
Huettenhain, H., *See* Buder, M.K., 3:44122
Huey, C., *See* Brinckman, F.E., 3:45350
See Iverson, W.P., 3:45347
Huffman, S., User's manual: computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters, 3:44835 (N—77-33602)
Hugenschmidt, M., *See* Vollrath, K., 3:45904
Huggins, R.A., Solid electrolyte battery materials. Final report, 1 July 1976—31 September 1977, 3:44851 (AD-A—048330)
Hughes, E.D., *See* Lyczkowski, R.W., 3:44820
Hugill, J., Empirical tokamak scaling, 3:45891
Hui, B.H., Runaway electrons in collective electric fields, 3:45956
Huizenga, J.R., *See* Birkelund, J.R., 3:45711
Hulme, B.L., Codes for Dijkstra's shortest path algorithm, 3:46139 (SAND—78-0493)
Humphrey, H.E.B., Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
Humphrey, J.P., Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October—December 1977, 3:44203 (FE—2346-20)
Humphries, S. Jr., *See* Poukey, J.W., 3:45247
Hundeshagen, C., *See* Grams, W., 3:44026
Hungerford, H.E., Theory and use of Maniscalco two-medium buildup factors, 3:45815
Hunter, T.O., *See* Howard, J.E., 3:46128
Hurtt, C.C., *See* Naus, D.J., 3:44761
Hus, J.P., Quantum Electrodynamics Within the Framework of a New Four-Dimensional Symmetry, 3:45668
Hutchinson, I.H., Mechanism for the ω/ sub p/e radiation in Tokamaks, 3:45886
Huth, G.C., *See* Dabrowski, A.J., 3:45255
Hyde, E.K., *See* Westfall, G.D., 3:45707
Hyodo, T., *See* Oka, Y., 3:44707
Hyuga, H., *See* Arima, A., 3:45693

I

Ichikawa, Y.H., Contribution of higher order terms in the reductive perturbation theory. 2. A case of strongly dispersive wave, 3:46039 (N—77-33992)
See Khiet, T., 3:46037
Idehara, T., Instability of the Trivelpiece mode in a magnetized beam-plasma system, 3:46032
Igitkhanov, Y.L., *See* Volkov, T.F., 3:45967
Igitkhanov, Yu.L., Possibility of wall-protecting cold-plasma layer formation in a tokamak reactor, 3:46092
Igo, G., *See* Hoffman, G.W., 3:45702
See Nasser, M.A., 3:45573
Iguchi, H., *See* Mase, A., 3:46035
Ihm, J., Diamond-metal interfaces and the theory of Schottky barriers, 3:45836
Iida, K., Changes in fatigue crack shape during growth, 3:44750 (IAEA—18; CONF-751268—, pp 87-100)
Iijima, T., *See* Otani, K., 3:44626

Ikemura, T., Nonlinear electrostatic ion cyclotron waves in an rf-plugged inhomogeneous plasma slab, 3:45550 (N—77-33990)
Ikezi, H., Nonlinear self-modulation of ion-acoustic waves, 3:46034 (IPPJ—289)
Ikonnikov, D.S., *See* Zykov, B.M., 3:45032
Ikuta, K., Equilibrium of REB-ring with soft-core, 3:45945 (N—77-33978)
Expression for β in linked min-B configurations, 3:45961
See Mohri, A., 3:46107
Im, K.H., Nucleation and evolution of slag droplets in coal combustion, 3:44132 (CONF-780307—8)
Imlay, R., *See* Wanderer, P., 3:45570
Infuehr, E., *See* Friedrich, K., 3:44822
Ingeneri, S.M., *See* Warman, E.A., 3:44830
Ingersoll, D.T., Integral tests of niobium cross sections through simultaneous measurements of neutron and gamma-ray leakage spectra, 3:45816
Ingle, R.W., *See* Gwin, R., 3:45773
Innes, W.B., Thermocatalytic detection of NO/sub x/, 3:44983
Innes, W.R., *See* Fisk, R.J., 3:45575
Inogamov, N.A., Self-similar snowplow plasma flows, 3:45963
Inogamova, T.Y., *See* Angelov, N., 3:45589
Inoue, S., *See* Itoh, K., 3:45990
See Tange, T., 3:45946
Inouye, H., *See* Thomas, E.W., 3:45058
Iofa, M.Z., Spontaneous breaking of scale invariance in gauge theories, 3:45652
Irkhin, Y.P., Anisotropy of the electrical resistivity of rare-earth metals, 3:45033
Irving, A.C., *See* Berger, E.L., 3:45636
Isaacson, R.E., *See* Geiger, J.F., 3:44292
Isaichev, V.I., *See* Larikov, L.N., 3:45034
Isenor, N.R., *See* Richardson, M.C., 3:45930
Iserov, A.D., *See* Kovbasyuk, V.I., 3:44901
Ishchenko, V.N., Periodic operation of a KrF excimer laser, 3:45208
Ishida, Y., *See* Idehara, T., 3:46032
Ishihara, A., *See* Fujino, H., 3:45140
Ishizuka, H., *See* Kawabe, T., 3:45892
Iskander, S.K., *See* Rodabaugh, E.C., 3:44760
Isyanova, E.D., *See* Batishche, S.A., 3:45193
Ita, L.E., Study of solar assisted thermal diffusion separating systems for isotopic fuels, 3:44320 (CONF-761220—, pp 337-338)
Itagaki, T., FIR-interferometer for JT-60, 3:45901 (JAERI-M—7121)
See Matoba, T., 3:45902
Itatani, R., *See* Abe, H., 3:45875
See Fukumasa, O., 3:46040
Ito, A.S., *See* Fisk, R.J., 3:45575
Ito, Y., *See* Mase, A., 3:46035
Itoh, K., Saturation of kink instability and helical equilibrium of current carrying plasma column, 3:45990 (N—77-33993)
See Tange, T., 3:45946
Ivanilov, A.A., *See* Baranov, D.S., 3:45571
Ivanov, A.A., *See* Babaritskii, A.I., 3:45983
Ivanov, B.A., *See* Gosteva, T.S., 3:45940
Ivanov, M.Y., Gas-dynamic mechanism of inelastic collisions of heavy nuclei at high energies, 3:45807
Ivanov, N.V., Observation of nonelectrostatic rf noise in the T-4 tokamak, 3:46070
Ivanov, Y.B., Calculation of the coefficient of surface tension of a nucleus, 3:45783
Ivanovskaya, I.A., *See* Angelov, N., 3:45589
Ivantsova, V.V., *See* Shimanskii, V.K., 3:45435
Iverson, W.P., Biological and nonbiological transformations of mercury in aquatic systems, 3:45347
See Brinckman, F.E., 3:45350
Iwamoto, M., *See* Fujino, H., 3:45140
Iwata, S., *See* Cobb, J.H., 3:45559
Iwata, T., *See* Hattori, T., 3:44976
Izmailov, G.N., *See* Gradov, O.M., 3:46068

J

Jackman, A.H., Delayed hydrogen cracking of zirconium alloy pressure tubes, 3:44678 (CONF-760688—, pp 33-45)
Jackson, T.A., Stable carbon isotope ratios and chemical properties of kerogen and extractable organic matter in prephanerozoic and phanerozoic sediments: their interrelations and possible paleobiological significance, 3:44209
Jacob, J.H., *See* Srivastava, B.N., 3:45163, 3:45164
Jacobs, R.B., *See* Henderson, T.M., 3:44318
Jacquet, F., *See* Merritt, F.S., 3:45569
Jaegle, P., Progress on x-ray laser research, 3:45216
Jaffe, J., *See* Reed, M.G., 3:44160
Jahn, A., Folding principle and the simulation of the dynamic thermal spatial behavior. Pt. 2, 3:44942
Jain, M., *See* Riley, P.J., 3:45704
Jakob, W., Preparation, construction, and operation of a plant for recharging groundwater in the Halle Region, 3:44091
Jamelot, G., *See* Jaegle, P., 3:45216
James, D.J., *See* Corkum, P.B., 3:45214
James, L.W., *See* Nelson, N.J., 3:44366
Jamison, K.A., Nonstatistical population of magnetic substates of the $(1s^{-1}2p^{-1})\ ^1P_1$ state in Al, 3:45532
Janoski, E.J., *See* Schneider, A., 3:44064
Jared, R.C., *See* Wozniak, G.J., 3:45760
Jaros, J.A., Observartion of $\mu 3\pi$ events in e^+e^- annihilation, 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Jarrett, N., Production of aluminum-silicon alloy and ferrosilicon and commercial purity aluminum by the direct reduction process. First quarterly progress report, 1 September 1977—30 November 1977, 3:45003 (TID—28260)
Jean-Louis, M., Apparatus for the infrared spectroscopic study of solids at high pressures (12 kbars) and low temperatures (4.2°K and 2°K), 3:45099 (UCRL-Trans—11353)
Jeannard, P., French mining equipment industry, 3:44118
Jeffries, R.A., *See* Wescott, E.M., 3:45484
Jenkins, L.H., *See* Noonan, J.R., 3:45011
Jenkins, P.E., Modular solar house, 3:44404 (CONF-761220—, pp 9-12)
Jenks, R.L., Comparison of simulated solar cooling systems in Saudia Arabia, 3:44432 (CONF-761220—, pp 315-317)
Jennett, J.C., *See* Rolfe, G.L., 3:45312
Jennings, J.K., New structural model for humic material which shows sites for attachment of oxidized uranium species, 3:44240 (USGS-CIRC—753, pp 10-11)
Jensen, B.H., Wind-solar coupled domestic heating system, 3:44419 (CONF-761220—, pp 195-196)
Jensen, C.M., *See* Macbeth, P.J., 3:45314
Jensen, R.N., Solar heating system, 3:44447
Jensen, R.T., *See* Davis, P.R., 3:44803
Jensen, R.V., *See* Post, D.E., 3:45965
Jerneloev, A., Feasibility of restoring mercury-contaminated waters, 3:45353
Jesse, D.R., *See* Crouch, W.B., 3:44168
Jessup, R.L., Full-opening annulus pressure operated sampler valve with reverse circulation valve, 3:44154
Jewell, D.M., *See* Cronauer, D.C., 3:44033
Jewett, K.L., *See* Brinckman, F.E., 3:45350
See Iverson, W.P., 3:45347
Jiang, S.H., Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron, 3:45718
Joestlein, H., *See* Fisk, R.J., 3:45575
Johanson, E.E., *See* Feick, G., 3:45355
John, J., *See* Steinman, D.K., 3:44235
Johnson, A.C., Commercialization of solar heating and cooling of buildings, 3:44347 (CONF-761220—, pp 425-426)
Johnson, A.D., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Johnson, A.I., Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC), 3:44429 (CONF-761220—, pp 301-303)
Johnson, B.R., New numerical methods applied to solving the one-dimensional eigenvalue problem. Interim report, 3:45852 (AD-A—048446)
Johnson, C.S., *See* Corlis, N.E., 3:44310
Johnson, G.K., *See* Lyon, W.G., 3:44998
Johnson, H.R., Mechanical properties of sulfamate nickel electrodeposits, 3:45014 (SAND—77-8042)
Johnson, I., *See* Vogel, G.J., 3:44131
Johnson, K.K., *See* Nelson, N.J., 3:44366
Johnson, M.A., *See* Shore, B.W., 3:45862
Johnson, N.R., *See* Guidry, M.W., 3:45748
See Sayer, R.O., 3:45750
Johnson, R.C., *See* Wall, N.S., 3:45796
Johnson, R.N., Friction, wear, and corrosion of laves-hardened nickel alloy hardsurfacing in sodium, 3:44695 (HEDL-SA—1391)
Johnson, R.R., Repetitive output laser system and method using target reflectivity, 3:46109
See Campbell, P.M., 3:46116
Johnson, R.T., *See* Davis, P.R., 3:44803
Johnson, T.V., *See* Fanale, F.P., 3:45477
Johnson, W.R., Relativistic effects on low-energy $5s \rightarrow \epsilon p$ photoionization for xenon, 3:45497
Spatial distribution of fission product energy, 3:44831
Johnston, G.L., *See* Sen, A., 3:46048
Johnston, S., Lie-operator approach to mode coupling in nonuniform plasma, 3:45957
Jones, A.R., Method to convert coal and water into at least hydrocarbon and system to carry out such a method, 3:44059
Jones, I.W., Thermo-electric generators, 3:44904
Jones, J.D.C., *See* Shaw, M.J., 3:45188
Jones, J.K., *See* Biederman, R.R., 3:44801
Jones, M., *See* Bell, J., 3:45567
Jones, R.T., Adjuster rod experiments in ZED-2, 3:44674 (AECL—5853)
Measurement of a relative conversion ratio in 19-element ThO_2-UO_2 fuel, 3:44670 (AECL—5825)
Jones, R.W., *See* Jenks, R.L., 3:44432
Joshi, M.S., Radiation-induced crosslinking of polyethylene in the presence of bifunctional vinyl monomers, 3:45127 (ORO—2845-T1)
Junduls, P., *See* Hensel, W., 3:44840
Jung, J., *See* Youngquist, J., 3:44627

Jungk, H., *See* Scholz, H., 3:44507
Jurgens, B., *See* Sinman, A., 3:45900
Justi, E., Low-loss solar heat collectors, 3:44512

K

Kadel, R.W., *See* Cester, R., 3:45576
Kadomtseva, A.M., *See* Derkachenko, V.N., 3:45098
Kadotani, H., *See* Kawai, M., 3:44702
Kadoya, S., Method of processing liquid radioactive wastes, 3:44285
Kadyk, J.A., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Kaeppeler, F., *See* Wisshak, K., 3:45771
Kaga, A., *See* Noda, T., 3:44587
Kahler, A.C., *See* Guidry, M.W., 3:45748
Kahn, E., Reliability of wind power from dispersed sites: a preliminary assessment, 3:44602 (LBL—6889)
Kajitani, H., *See* Abe, H., 3:45875
Kalandarishvili, A.G., *See* Gverdtsiteli, I.G., 3:44905
Kalibjian, R., 100-ps framing-camera tube, 3:45269
Kalimov, A.G., *See* Berdnikov, Y.A., 3:45710
Kalinichenko, S.S., *See* Voitsenya, V.S., 3:45939
Kallosh, R.E., Gauge invariance in supergravitation, 3:45859
Kalmykova, S.S., Global instability of a nonequilibrium plasma slab, 3:46020
Kamakura, Kanagawa, *See* Morimoto, Giroshi, 3:44173
Kamimura, T., Simulation study of Bernstein modes, 3:46044
See Ikezi, H., 3:46034
See Ohsawa, Y., 3:45874, 3:46041
Kaminsky, M., *See* Das, S.K., 3:45060
Kamiya, K., Method of filling with radioactive wastes, 3:44286
See Kikuchi, M., 3:44298
Kammash, T., *See* Gilligan, J.G., 3:45960
Kamperschroer, J.H., Use of a Hall accelerator in the production of negative hydrogen ions in cesium vapor, 3:46106
Kanadero, U.K., Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals, 3:45084 (ANL-Trans—1130)
Kanarek, T., *See* Angelov, N., 3:45589
Kando, P.F., Development of latent heat of fusion type materials, 3:44562 (CONF-761220—, pp 42-44)
Kapany, N.S., High efficiency solar panel, 3:44510
Kapetanakos, C.A., *See* Golden, J., 3:45170
See Marsh, S.J., 3:45882
See Pasour, J.A., 3:45500
Kaplan, D.M., *See* Fisk, R.J., 3:45575
Kaplan, M., *See* Miller, J.M., 3:45751
Kaplan, S.A., Influence of plasma effects on the conditions for observing lines in the solar spectrum of radio emission, 3:45460
Kaptsov, L.N., *See* Golyaev, Y.D., 3:45195
Karamyan, Z.K., *See* Budagov, Y.A., 3:45590
Karney, C.F.F., *See* Sen, A., 3:46048
Kartsounes, G.T., *See* Kim, C.S., 3:44836
Kas'yan, V.G., *See* Dyatlov, M.K., 3:45207
Kas'yanov, Y.S., Time evolution of the electron temperature in a laser-produced carbon plasma, 3:45915
Kasai, S., *See* Oka, Y., 3:44707
Kashiya, V.G., *See* Gverdtsiteli, I.G., 3:44905
Katerberg, J.A., Low-temperature specific heat, thermal conductivity, and ultrasonic velocity of glassy carbons, 3:45096
Katkov, V.M., Bremsstrahlung in collisions of electrons in a magnetic field, 3:45610
Katz, M., Effects of heavy metals on fish and aquatic organisms, 3:45339
Kaufman, A.N., *See* Johnston, S., 3:45957
Kaufman, L., *See* Perez-Mendez, V., 3:45254
Kawabe, T., Injection of electron beams into mirror confined plasmas (I), 3:45892 (UCRL-Trans—11356)
See Mase, A., 3:46035
Kawagoshi, H., Process for steam reforming of hydrocarbons, 3:44162
Kawahara, M., *See* Iida, K., 3:44750
Kawai, M., Study of applicability of an albedo Monte Carlo method for neutron streaming calculation, 3:44702
Kawamoto, T., Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system, 3:44299 (ORNL-tr—4632)
See Terai, R., 3:44300
Kawazu, H., *See* Kadoya, S., 3:44285
Kazakevich, O.V., *See* Derkachenko, V.N., 3:45098
Kazanets, G.I., *See* Baksht, F.G., 3:45926, 3:45927
Kazmerski, L.L., Auger electron spectroscopy studies of I—III—VI_2 chalcopyrite compounds, 3:45114
Keeler, R.N., *See* Hawke, R.S., 3:45089
Keely, R.B., *See* Anderson, R.T., 3:44275
Kehler, P., Two-phase flow measurement by radioactive tracer techniques, 3:44798 (CONF-771126—8)
Keizer, P.D., Residues of Bunker C oil in Chedabucto Bay, Nova Scotia, 6 years after the Arrow spill, 3:44177
See Gordon, D.C. Jr., 3:45413
Kel'man, E.A., *See* Kulik, I.O., 3:45146
Kelleher, D., *See* Holtzscheiter, E.W., 3:44324
Keller, G.V., Exploration for geothermal energy on Oahu, Hawaii. Final report, 3:44570 (AD-A—046954)
Kelleter, H.J., Possibilities and principal features of the use of renewable resources in the FRG, 3:44898
Kelley, J.A., *See* Bibler, N.E., 3:44290
Kenefick, R.A., *See* Riley, P.J., 3:45704
Kennedy, A.J., *See* Cook, C.S., 3:44900
Kenney, R.W., *See* Alston-Garnjost, M., 3:45583, 3:45584
Kephart, R.D., *See* Fisk, R.J., 3:45575
Kepler, R.G., Piezoelectricity and pyroelectricity in polyvinylidene fluoride, 3:45080
Kerbikov, B.O., Annihilation widths and shifts of quasinuclear NN-bar levels in the coupled-channel model, 3:45856
Kermerov, A.I., Predicting water inflow in the Kuzbass pits, 3:44113
Keski Rahkonen, O., Relativistic effects in the calibration of electrostatic electron analyzers. I. Toroidal analyzers, 3:45262
Ketterson, J.B., *See* Dye, D.H., 3:45029
Kettner, D.A., *See* Okazaki, A., 3:44672
Khachatryan, G.N., Inclusive annihilation of a polarized e^+e^- pair with two detected hadrons, 3:45609
Kharbediya, L.I., Relativity of space finiteness—infiniteness for some Friedmann cosmological models, 3:45471
Kharin, D.A., *See* Andreev, S.S., 3:45430
Kharzheev, Y.N., *See* Amaglobeli, N.S., 3:45587
Khersonskii, V.K., Infrared emission of interstellar HD molecules, 3:45465
Khiet, T., Nonlinear propagation of the ordinary mode in a hot magnetoplasma, 3:46037 (N—77-33982)
Khitrik, S.I., *See* Nefedov, Yu.A., 3:44084
Khlybov, E.P., *See* Vereshchagin, L.F., 3:45035
Khokhlov, V.A., *See* Derkachenko, V.N., 3:45098
Kholyavin, I.I., Integral equations of scattering theory and the strong-coupling method, 3:45803
Khomich, A.A., *See* Polishchuk, V.N., 3:45736
Khorasanov, L.G., Higher-harmonic generation in a plasma excited at the lower hybrid frequency, 3:46057
Khristenko, E.V., *See* Dmitriev, V.M., 3:45046
Khudaverdyan, A.G., *See* Asaturyan, V.M., 3:45563
Khvastunov, V.M., *See* Nemashkalo, A.A., 3:45735
Kiba, T., Analysis of interrelation of hot spring waters using a multi-component concentration correlation matrix, 3:44574 (CONF-7610123—6)
Kiceniuk, J.W., *See* Payne, J.F., 3:45416
Kidder, R.E., Basic requirements of laser fusion power production and laser fusion-fission plutonium breeding, 3:46105
Kikta, T.J., Detection of radioactive surface and weld contamination (ThO_2 and $^{233}UO_2$) on light water breeder reactor fuel rods using alpha ionization detectors (LWBR development program), 3:44697 (WAPD-TM—1130)
Kikuchi, M., Method of storing radioactive wastes, 3:44298
See Kamiya, K., 3:44286
Kildal, H., Efficient high energy infrared third harmonic generation in gases and liquids for laser fusion applications. Annual progress report, 1 March 1977—28 February 1978, 3:45165 (COO—4251-6)
Killough, G.G., INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM—84)
Kim, C.S., Parametric study of turbine systems for compressed air energy storage plants, 3:44836 (ANL/ES—64)
Kim, G., *See* Dolbear, G.E., 3:44990
Kim, J., *See* Whealton, J.H., 3:46103
Kim, K.C., Infrared spectroscopy in supersonic molecular beams: ν_3 band of SF_6 at 10.6 μm, 3:45503
Kim, Y., *See* Gillespie, G.H., 3:45535
Kimura, H., *See* Yamamoto, S., 3:45938
King, J.H., Interplanetary medium data book, 3:45473 (N—77-34065)
Interplanetary medium data book, appendix, 3:45474 (N—77-34066)
King, P.J., Report of the inquiry into serious gas explosions, 3:44888
King, T.N., *See* Kiss, L.T., 3:44075
Kinjo, H., *See* Nishimura, T., 3:44703
Kinnaman, T.L., LOFT pressurizer surge and spray line piping thermal analysis, Class I review, 3:44783 (LTR—1144-36)
Kirakosyan, Z.A., *See* Budagov, Y.A., 3:45590
Kirichenko, I.K., Distribution of nonequilibrium excitations and phonon generation in superconducting tunnel junctions, 3:45842
Kirii, A.Y., *See* Andreev, N.E., 3:46016

Kirkorian, E., Thin film photovoltaic diodes and method for making same, 3:44379
Kirwan, D.J., Gas—solids interactions in the distribution zone of a fluidized bed: Phase I. Quarterly report, May 1—July 31, 1977, 3:44133 (FE—2451-5)
Kiskis, J., Disconnected gauge groups and the global violation of charge conservation, 3:45654
Kiss, L.T., Expression of results of coal analysis: the case for brown coals, 3:44075
Kistner, O.C., Multiple high-spin band structure in ^{164}Er, 3:45749
Kitagawa, Y., *See* Thein, A., 3:45932, 3:45941
Kladnitskaya, E.N., *See* Angelov, N., 3:45589
Klainer, S., *See* Hercher, M., 3:45181
Klammer, H., Waste energy utilization in a rolling mill and in the subsequent treatment, 3:44960
Kleiman, E.B., *See* Kaplan, S.A., 3:45460
Kleine, F., Energy engineer - a profession of the near future, 3:44933
Kleinman, L.I., Infrared fluorescence measurement of equilibrium and vibrational temperatures in laser-irradiated gases, 3:45522
Klemm, R.A., *See* Hertz, J.A., 3:45834
Kliauga, P., *See* Varma, M.N., 3:45827
Kligler, D., Energy ordering of the excited states of XeF, 3:45173
Klimanov, V.A., *See* Abagjan, A.A., 3:45824
Klimenko, S.V., *See* Antipov, Y.M., 3:45586
Klimisch, R.L., Chemistry of degradation in automotive emission control catalysts, 3:44992
Klimovskii, I.I., *See* Kovbasyuk, V.I., 3:44901
Kline, R.V., *See* Bebek, C.J., 3:45562
Knapp, G.A., *See* Craik, N.G., 3:44677
Kniseley, R.N., *See* Haas, J.W. Jr., 3:45112
Knoeoes, S., Thermodynamic engine used as a refrigerator or as a heat engine, 3:45243
Knyazev, Y.V., Optical properties of thulium in the 0.06—4.9-eV energy range, 3:45040
Ko, K.C.C., *See* Fung, P.C.W., 3:46055
Ko, R., Single carrier method for the emission spectrometric analysis of uranium-plutonium oxides, 3:44262
Kobayashi, H., *See* Hayami, H., 3:44595
Kobos, A.M., *See* Wall, N.S., 3:45796
Koch, H., Coal handling and coal burning for electricity generation in large power stations in the Federal Republic of Germany, 3:44127
Koch, R.A., Doppler model for adiabatic toroidal compressor driftwave frequency profiles, 3:46045
Kochetov, I.V., *See* Konev, Y.B., 3:45203
Kochowski, C., *See* Bell, J., 3:45567
Koerner, H., *See* Henning, W., 3:45740
Koester, D.W., *See* Doelp, L.C., 3:44994
Koga, A., Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields, 3:44586 (CONF-7410177—3)
Kogan, E.Y., Electron density balance and stabilization of wave profile, 3:46056
Kogan, L.A., *See* Bulashev, V.M., 3:44078
Kogoshi, S., *See* Sato, K.N., 3:46122
Kojima, S., *See* Kawabe, T., 3:45892
Kolesnichenko, Y.I., *See* Belikov, V.S., 3:45976
Kolesnikov, E.K., Optimum parameters of a dense freely expanding deuterium—tritium plasma, 3:45972
Kolevatov, Yu.I., *See* Abagjan, A.A., 3:44769
Koltick, J.M. Jr., *See* Lowery, G.W., 3:44410
Komel'kov, V.S., Coaxial accelerator for dense plasmas, 3:45986
Komizo, M., *See* Akaishi, K., 3:46133
Komoto, T., *See* Sidhu, G.S., 3:45826
Kon, L.Z., Thermoelectric effect in superconducting alloys with an ordered magnetic moment distribution, 3:45846
Kondoh, Y., Numerical computation of high-beta toroidal diffuse equilibria, 3:46100
Konev, Y.B., Effect of line selection on the output of a CO laser, 3:45203
Konno, K., *See* Ichikawa, Y.H., 3:46039
Konov, V.I., *See* Goncharov, N.I., 3:45985
Konyushko, V.I., *See* Baranov, D.S., 3:45571
Koonin, S.E., *See* Flocard, H., 3:45695
See Negele, J.W., 3:45765
Koopman, D.W., *See* Mahon, R., 3:45168
Koops, J.E., *See* Meyer, R.A., 3:45730
Kop'ev, P.S., *See* Alferov, Z.I., 3:45194
Kopeliovich, V.B., Production of relativistic particles on nuclei at large angles and the role of multiple processes, 3:45642
Kopetskii, C.V., *See* Vinnikov, L.Y., 3:45049
Kopp, K., *See* Gnugesser, E., 3:44950
Kopylov, G.I., *See* Angelov, N., 3:45588
Korablev, V.M., *See* Baranov, D.S., 3:45571
Korda, I.M., *See* Batishche, S.A., 3:45193
Korenman, G.Y., Effective Hamiltonian for radiative capture of pions by complex nuclei, 3:45801
Koropotkina, T.I., *See* Girich, B.G., 3:45186
Korotkov, V.A., *See* Baranov, D.S., 3:45571
Korpela, T., Economic optimization of counter-flow heat exchanges, 3:45221
Kosaka, J., *See* Takaesu, K., 3:44588
Koshilev, N.A., Ion heating and fine structure of the potential in the interaction of a magnetic piston with a plasma, 3:45896
Measurements of the ion energy spectrum in a collisionless neutral current sheet, 3:45942
Kotilainen, H., Written comments concerning the different topics of the meeting, 3:44751 (IAEA—18; CONF-751268—, pp 377-381)
Kotochigova, S.A., *See* Kozlov, M.G., 3:45512
Kourkoumelis, C., *See* Cobb, J.H., 3:45559
Kouzes, R.T., *See* Struble, G.L., 3:45747
Kovalenko, V.P., Steady-State nonlinear waves in a plasma with a modulated electron beam, 3:46062
Kovan, I.A., *See* Ivanov, N.V., 3:46070
Kovar, D.G., *See* Henning, W., 3:45740
See Paul, M., 3:45716
See Rehm, K.E., 3:45725
See Tabor, S.L., 3:45714
Kovbasyuk, V.I., Interelectrode arcs and electrical fluctuations in an MHD channel, 3:44901 (CONF-770402—3)
Kovrizhnykh, L.M., Modulational instability and nonlinear waves in a cold plasma, 3:46026
See Bulanov, S.V., 3:46078
Kovtun, N.M., *See* Derkachenko, V.N., 3:45098
Kowalski, G., Device for measuring radiation absorption in a layer of a body, 3:45272
Kowalski, L., *See* Miller, J.M., 3:45751
Koyama, K., *See* Oka, Y., 3:44707
Kozin, M.G., *See* Bogdanov, P.V., 3:45051
Kozlov, M.G., Absorption spectrum of ytterbium vapor in the 1700—1060 A region, 3:45512
Kozlov, N.P., Formation of plane shock wave in the plasma focus zone of a magnetoplasma compressor, 3:45984
Kozlovskii, D.A., *See* Aristov, A.V., 3:45198
Kozubovskii, V.R., *See* Danileiko, M.V., 3:45196
Kraemer, J., Origins, development, and targets of the VDI Kommission Reinhaltung der Luft, 3:45308
Krafczyk, G., *See* Barish, B.C., 3:45566
See Merritt, F.S., 3:45569
Kramer, S.L., Polarization parameter for nucleon-nucleon elastic scattering at 11.8 GeV/c, 3:45577
Krapp, R., *See* Bammert, K., 3:44396
Krasnov, Y.K., Impedance of type II superconductors in the Shubnikov phase, 3:45850
Kraus, D.E., *See* Herbert, M.L., 3:45568
Krause, M.O., *See* Keski Rahkonen, O., 3:45262
Kravchenko, V.P., *See* Ladikov, Y.P., 3:46015
Kravitz, S., *See* Durkin, J.A., 3:44170
Kravtsov, A.V., Determination of the electromagnetic radii of the nucleon, 3:45608
Kravtsov, N.V., Axial mode locking in a solid-state laser with a time-varying cavity, 3:45206
Krebs, C.T., Long-term effects of an oil spill on population of the salt-marsh crab Uca pugnax, 3:45414
Krefft, G.B., Volume expansion and annealing compaction of ion-bombarded single-crystal and polycrystalline α-Al_2O_3, 3:45104
Kremer, R., Gas-heated boiler plants with an efficiency of more than 100%, 3:45233
Kremheller, A., *See* Jenks, R.L., 3:44432
Krenkel, P.A., Heavy metals in the aquatic environment, 3:45338
See Reimers, R.S., 3:45344
Kress, T.S., *See* Oezisik, M.N., 3:44821
Krinninger, H., Today's and tomorrow's energy sources for homes, 3:44342
Krisko, W.J., Evaluation of the use of air curtains to increase face ventilation. Final report, April 1975—March 1977, 3:44096 (PB—274324)
Krokhin, O.N., *See* Basov, N.G., 3:46124
See Bychenkov, V.Y., 3:45918
Krompholz, H., *See* Herziger, G., 3:45936
Kruger, C.H., *See* Bender, D.J., 3:45508
Kruse, T.H., *See* Todd Baker, F., 3:45755
Krylov, B.E., *See* Kozlov, M.G., 3:45512
Kubis, J.J., *See* Campbell, P.M., 3:46116
See Cover, R.A., 3:45906
Kuczynski, G.C., Minimum entropy production principle and Ostwald ripening, 3:45831 (COO—4385-1)
Kudeyarov, Y.A., *See* Ivanov, M.Y., 3:45807
Kudryavtsev, A.E., Change in the behavior of formfactors of compound systems as high transferred momenta are approached asymptotically, 3:45857
See Kerbikov, B.O., 3:45856
Kuehner, R., *See* Bahel, V.O., 3:44445
Kuhl, D.E., Computerized emission transaxial tomography and determination of local brain function, 3:45392
Radionuclide computerized tomography for brain study, 3:45388
Kukushkin, A.S., *See* Igitkhanov, Yu.L., 3:46092
Kulakovskii, M.A., *See* Bakumenko, O.D., 3:44700
Kulik, I.O., Current-controlled superconductive bridge contacts, 3:45146
Properties of superconducting microbridges in the pure limit, 3:45843
See Mineneko, E.V., 3:45839

Kulygina, E.P., *See* Girich, B.G., 3:45186
Kumamoto, S., Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP—22840)
Kummer, J.T., Oxidation of CO and C_2H_4 by base metal catalysts prepared on honeycomb supports, 3:44996
Kunica, S., *See* Root, E.F., 3:44550
Kuntsevich, B.F., Laser action at 16 μ by optical pumping of CO_2 with an HF laser, 3:45204
Kunz, L.J. Jr., *See* Zito, R. Jr., 3:44910
Kuo, T.T.S., *See* Leinaas, J.M., 3:45855
Kuplennikov, E.L., Quasielastic scattering of electrons by ^{6}Li, ^{7}Li, and ^{9}Be and the final-state interaction, 3:45709
Kurachenko, Yu.A., *See* Abagjan, A.A., 3:44769
Kurfess, J.D., *See* Share, G.H., 3:45256
Kuroda, O., *See* Otani, K., 3:44626
Kusianovich, J., Operating results: a competitively priced home heated by concentrating solar collectors, 3:44420 (CONF-761220—, pp 229-230)
Kusubov, A., *See* Swift, R.P., 3:45076
Kusuda, T., Estimating the energy conservation potential of ventilation control through weather data analysis. Final report, 3:44946 (PB—273949)
Kuteev, B.V., *See* Voronov, V.M., 3:45921
See Zhilinskii, A.P., 3:45920
Kuz'min, E.V., Electronic properties of transition metal dioxides, 3:45073
Kuznetsov, E.P., *See* Baranov, D.S., 3:45571
Kvlividze, V.A., *See* Zhdanov, V.P., 3:45978
Kwak, H., *See* Horton, W. Jr., 3:45994
Kwan, B.P., *See* Jaros, J.A., 3:45561

L

L'Archeveque, J.V.R., *See* Yan, G., 3:44305
Ladikov, Y.P., Suppression of flute waves by a regulator with crossed feedback, 3:46015
Laing, N., Solar energy - competitive because of cascade batteries, 3:44567
Laitinen, H.A., Analytical techniques for heavy metals other than mercury, 3:45342
Lalet, A., *See* Beslu, P., 3:44655
Lammers, J., Application of latent-heat storage element in solar-heated buildings, 3:44557
Lampkin, C., *See* Berg, R.S., 3:44373
Lamzin, S.A., *See* Bisnovatyi-Kogan, G.S., 3:45448
Lance-Gomez, T., *See* Caird, J.A., 3:45162
Landau, R.H., Inclusive pion production in relativistic proton collisions with nuclei, a reexamination, 3:45637
Lande, K., *See* Bahcall, J.N., 3:45453
Landini, P., Polynomial solutions to the tensorial differential equations for monoenergetic neutrons in slab and sphere geometries, 3:45818
Landoni, J.A., Containment Atmosphere Response (CAR) program status report, 3:44806 (GA-A—14699)
Lane, N.F., *See* Cohen, J.S., 3:45536
Lanfermann, W., *See* Funke, W., 3:44107
Lang, C., Mixed control for radiators, 3:44928
Langley, R.A., *See* Pope, W.M., 3:45093
Langmuir, D., Refinement of the thermodynamic properties of uranium minerals and dissolved species, with application to the chemistry of ground waters in sandstone-type uranium deposits, 3:44228 (USGS-CIRC—753, pp 57-60)
Lanier, R.G., *See* Struble, G.L., 3:45747
Lankford, A.J., *See* Cobb, J.H., 3:45559
Lanning, W.C., Refining of shale oil, 3:44207 (BERC/IC—77/3)
Lannoye, P., *See* Deutsch, S., 3:44832
Lantzke, U., Will there be an energy crisis in 1985, 3:44875 (CONF-780444—1)
LaPoint, D.J., Geochemical interpretation of ore zonation at the Rifle vanadium mine, Colorado, 3:44226 (USGS-CIRC—753, pp 53-55)
Larikov, L.N., Mechanism of lithium diffusion in single-crystal molybdenum, 3:45034
Larsen, R.R., *See* Tanenbaum, W., 3:45602
Larson, D., *See* Bebek, C.J., 3:45562
Lasinski, T., *See* Longacre, R.S., 3:45634
Last, G.A., *See* Omberg, R.P., 3:44693
Lathan, W.A., *See* Binkley, J.S., 3:45544
Latif, F.A., Design and stability of master control systems for energy independent homes, 3:44435 (CONF-761220—, pp 325-328)
Latyshev, Y.I., Steplike structure produced on the superconducting transition of a tin film by microwave radiation, 3:45044
Latzko, D.G.H., Fracture safety of reactor vessels in the presence of nozzle corner cracks: Netherlands research programs, 3:44753 (IAEA—18; CONF-751268—, pp 249-257)
Some comments on the variations of crack growth along the crack front at nozzle corners, 3:44752 (IAEA—18; CONF-751268—, pp 101-102)
Lauer, E.J., Measurements of hose instability of a relativistic electron beam, 3:45993
Lauther, S., Solar heating system for greenhouses using LAING latent-energy storages, 3:44568
Laval, G., *See* Ramani, A., 3:46002
Lazarev, B.G., Critical magnetic fields of ultrathin bismuth films, 3:45045
Lazor, J.M., Yes: an industrial focusing non-tracking collector will work in Northeastern Ohio, 3:44493 (CONF-761220—, pp 227-228)
Lazzarini, A.J., Population of resonant $^{12}C + {}^{12}C$ states via the reaction $^{12}C(^{16}O, \alpha)^{24}Mg$, 3:45699
Leach, D.L., Hydrogeochemistry of uranium in the Walker River Basin, California and Nevada, 3:44233 (USGS-CIRC—753, pp 68-70)
Leavitt, A.W., *See* Dradesky, E.L., 3:44624
Lebedev, A.A., *See* Antipov, Y.M., 3:45586
Lebedev, V.V., Interaction between first and second sound in He^3-He^4 solutions, 3:45554
Lebrun, J., Device for converting of radiation into electric power, 3:44384
Lecomte, P., *See* Jaros, J.A., 3:45561
Lederman, L.M., *See* Fisk, R.J., 3:45575
Ledger, A.S., *See* Sun, C.T., 3:44617
Lednev, A.A., *See* Antipov, Y.M., 3:45586
Lee, B.W., SU(3) x U(1) gauge theory of weak and electromagnetic interactions, 3:45601
Lee, C.Y., Behavior of electric potential fields over randomly layered earth models. Doctoral thesis, 3:45432 (AD-A—046975)
Lee, D.M., *See* Burman, R.L., 3:45697
Lee, E.P., Resistive hose instability of a beam with the Bennett profile, 3:45992
See Lauer, E.J., 3:45993
Lee, G.F., Role of hydrous metal oxides in the transport of heavy metals in the environment, 3:45345
Lee, I.Y., *See* Guidry, M.W., 3:45748
Lee, K.H., Additive coloration of sapphire, 3:45086
Lee, S., *See* Baker, D.R., 3:45910
Lee, S.H., *See* Vogel, G.J., 3:44131
Lee, Y.C., *See* Hatori, T., 3:45949
Leech, C.A. III, Spinel solid solution catalysts for automotive applications, 3:44995
Lefort, G., Problems of dismantling, treating and analyzing highly irradiated fuel elements, 3:45151
Legg, G.G., Designing to minimize radiation exposure, 3:44795 (CONF-760688—, pp 1-19)
Lehmann, E.J., Seafarer: impacts and studies of the extremely low frequency communication system (a bibliography with abstracts). Report for 1964—January 1978, 3:45425 (NTIS/PS—78/0062)
Leibovitz, J., *See* Sawochka, S.G., 3:44647
Leinaas, J.M., Convergence properties of the Brillouin—Wigner type of perturbation expansion, 3:45855
Leith, D., Performance of a pulse jet filter at high filtration velocity. III. Penetration by fault processes, 3:45240
Leith, D.W.G.S., *See* Longacre, R.S., 3:45634
Lemons, D.S., Current-driven instabilities in a laminar perpendicular shock, 3:45488
Lengweiler, K., *See* Fairchild, R.G., 3:45828, 3:45829
Leon, I.W., Multicell fluidized-bed boiler design, construction, and test program. Monthly progress report No. 66, 3:44614 (FE—1237-T-7)
Leonard, R.P., Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974—April 1977, 3:45300 (PB—276169)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume II. Primary and secondary nonferrous smelting and refining. Final report, May 1974—April 1977, 3:45301 (PB—276170)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume III. ferrous smelting and refining. Final report, May 1974—April 1977, 3:45364 (PB—276171)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume IV. Appendices. Final report, May 1974—April 1977, 3:45365 (PB—276172)
Leontev, V.G., Effect of excitation conditions on the radial distribution of population inversion in the active element of a He—Ne laser, 3:45200
Leopold, K.E., *See* Corkum, P.B., 3:45214
Leppaekoski, E.J., Recovery of benthic macrofauna from chronic pollution in the sea area off a refinery plant, southwest Finland, 3:45418
Lepper, J.K., Explosives technology, 3:45282 (UCRL—50019-77-1, pp 7-11)
Fiber composite technology, 3:45079 (UCRL—50019-77-1, pp 1-2)
Flywheel program, 3:44839 (UCRL—50019-77-1, pp 2-7)
Organic Materials Division quarterly report, January—March 1977, 3:45078 (UCRL—50019-77-1)
Lesk, I.A., Solar fluid heater, 3:44540
Leslie, S.F., Annual heating energy demand of heavy domestic buildings. Report No. 16, 3:44940 (NP—23142)
Lester, G.R., Relative resistance of noble metal catalysts to thermal deactivation, 3:44989
Lettis, L.A. Jr., *See* Bryan, J.B., 3:45433

Leung, S.Y., *See* Weber, M.J., 3:45090
Levedev, V.M., *See* Teplov, I.B., 3:45804
Leveille, P., *See* de Vellis, J., 3:45371
Leventhal, J.S., Conceptual—mathematical models of uranium ore formation in sandstone-type deposits, 3:44251 (USGS-CIRC—753, pp 34)
See Jennings, J.K., 3:44240
Levin, B.P., Discussion of heat mirror film: performance, production process, and cost estimates, 3:44925 (LBL—7812)
Levin, P., *See* Gilai, D., 3:46094
Levin, V.G., *See* Dyatlov, M.K., 3:45207
Levine, B., Focusing resonance cones, 3:45868
Levy, E.M., *See* Butler, J.N., 3:44175
Levy, G.C., High-sensitivity Fourier transform NMR. Intermolecualr interactions between environmental toxic substances and biological macromolecules. Report for 2 October 1974—1 October 1976, 3:45297 (PB—274011)
Levy, P.W., *See* Fairchild, R.G., 3:45828, 3:45829
Lewis, E.L., *See* Alexander, B.M., 3:44281
Lewis, E.V., Maritime fuel conservation, 3:44953 (PB—275722)
Lewis, H.E., Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April—June 1977, 3:44062 (FE—2270-24)
Solvent refined coal (SRC) process. Operation of solvent refined coal pilot plant at Wilsonville, Alabama. Monthly technical progress report, March 1978, 3:44063 (FE—2270-29)
Lewis, J.H., *See* Brueckner, K.A., 3:45274
Lewis, S.B., *See* Shore, V.G., 3:45368
Li, L., *See* Cheng, T.P., 3:45619
Liao, N.S., *See* Chon, W.Y., 3:44802
Lichtenstadt, J., Observation of 12^- magnetic spin states in ^{208}Pb, 3:45758
Lidstone, R.F., *See* Dormuth, K.W., 3:44662
Lieb, K.P., *See* Hellmeister, H.P., 3:45726
Lieberman, B., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Lienard, J., *See* Cote, W., 3:44722
Lieser, K.H., *See* Zuber, G., 3:45117
Liewer, P.C., *See* Winske, D., 3:46005
Likhachev, V.P., *See* Nemashkalo, A.A., 3:45735
Likhachev, Yu.P., Lung tumors in rats on chronic inhalation of thorium dioxide, 3:45404 (ORNL-tr—4544)
Likhoded, A.K., Description of the energy dependence of inclusive cross sections in the double-Reggeon representation, 3:45635
Liljestrand, R.P., *See* Hoffman, G.W., 3:45702
Lilly, G.P., PWR FLECHT skewed profile low flooding rate test series evaluation report, 3:44819 (WCAP—9183)
Lim, C.B., *See* Perez-Mendez, V., 3:45254
Limon, P., *See* Edwards, D. Jr., 3:45225
Limonova, V.Ya., *See* Eremin, I.V., 3:44080
Lin, A.T., Nonlinear evolution of drift Alfven and double tearing instabilities, 3:46006
Lin, C.I., *See* Berk, J.V., 3:44938
Lin, K.C., *See* Tsay, Y.J., 3:44473
Lin, S., Design criterion on flat solar collectors based on thermal efficiency measurements, 3:44482 (CONF-761220—, pp 83-84)
Lind, J.M., *See* Alburger, D.E., 3:45698
Lindau, I., Synchrotron radiation research: Recent developments, 3:45113
Lindholm, F.A., *See* Neugroschel, A., 3:44365
Lindmayer, J., Method of forming silicon solar energy cell having improved back contact, 3:44378
Solar panel, 3:44380
Lindner, F., Heat exchange processes for latent heat storage devices, 3:44845
Lindsey, D.A., *See* Dooley, J.R. Jr., 3:44249
See Zielinski, R.A., 3:44220
Lindstroem, L.S., *See* Leppaekoski, E.J., 3:45418
Lindstrom, P.J., *See* Heckman, H.H., 3:45572, 3:45688
Linevsky, M.J., Chemical laser potential of selected group IV-A metal oxides. Final report, 3:45161 (AD-A—048779)
Ling, T.Y., *See* Wanderer, P., 3:45570
Linglin, D., *See* Chadwick, G.B., 3:45585
Linz, A., *See* Weber, M.J., 3:45090
Lipatov, A.S., Numerical investigation of the collapse of Langmuir waves in a magnetic field, 3:46069
Lipkin, J., *See* Asay, J.R., 3:45017
Lisitsa, V.S., *See* Baryshnikov, F.F., 3:45518
Lisitsyn, V.N., *See* Ishchenko, V.N., 3:45208
Lister, D.H., Predicting radiation fields around reactor components, 3:44796 (CONF-760688—, pp 20-40)
Litke, A., *See* Jaros, J.A., 3:45561
Littig, G.A., *See* Johnson, W.R., 3:44831
Little, R.G., *See* Neal, W.R., 3:44323
Litvinenko, A.S., *See* Polishchuk, V.N., 3:45736
Liu, S.W., *See* Mirels, H., 3:45157
Lo, H., *See* Sun, C.T., 3:44617
Lobo, P.C., Optimal combinations of flat plate collectors configurations, 3:44485 (CONF-761220—, pp 99-104)
Loef, G.O.G., Heat absorber for solar energy, 3:44525
Modular construction for solar heat collector, 3:44523
Lof, G.O.G., Solar heating system and operation thereof, 3:44448
Lofgren, E.V., *See* Cockayne, J.E., 3:45286
Logan, D., *See* Miller, J.M., 3:45751
Logan, J.D., Determination of voltage in exploding-foil experiments, 3:45280
Logunov, A.A., *See* Arbuzov, B.A., 3:45597
Lokke, W.A., *See* Post, D.E., 3:45965
Loll, U., Technology of putrefraction of organic material for production of methane, 3:44334
Lomakin, Y.F., *See* Amaglobeli, N.S., 3:45587
See Budagov, Y.A., 3:45590
Longacre, R.S., K-matrix fits to $\pi N \to N\pi$ and $\pi N \to N\pi\pi$ in the resonance region $\sqrt{s} = 1.3$ to 2.0 GeV, 3:45634
Longenbaugh, R.A., Analyses of methods for the determination of water availability for energy development, 3:44854 (PB—274080)
Longhetto, A.T., Ideal greenhouse, 3:44408 (CONF-761220—, pp 111-112)
Technical economical study of the solar house situated in Cuarte De Huerva (Zaragoza), 3:44409 (CONF-761220—, pp 113-114)
Longua, K.J., First mechanized in-service inspection of EBR-II steam generator, 3:44778 (ANL—77-46)
Lonski, P.D., *See* Marks, J.R., 3:44436
Loosch, R., International nuclear fuel cycle evaluation program (INFCE), 3:44726
Lopez, J., *See* Cronauer, D.C., 3:44060
Lord, D.E., Optical inspection of small-diameter deep bores using rod optics with low-light television and still photography, 3:45224 (UCRL—52431)
Loree, T.R., Atomic fluorine laser: spectral pressure dependence, 3:45209
Loshkareva, N.N., *See* Tatsenko, O.M., 3:45071
Loucks, R.A., Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976—October 31, 1977. Volume I, 3:44204 (TID—28053/1)
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976—October 31, 1977. Volume II, 3:44205 (TID—28053/2)
Louie, S.G., *See* Ihm, J., 3:45836
Louis, W.C., *See* Bell, J., 3:45567
Lovelace, R.V., Astron stability against poloidal perturbations, 3:45878
Lovell, W., *See* Grise, F.G.J., 3:44621
Lovelock, J.E., Ionization detectors with iron-55 as a radioactive source, 3:45265
Low, F.E., Classical space-time concepts in high-energy collisions, 3:45628
Lowenstein, D., *See* Herbert, M.L., 3:45568
Lowenthal, D.D., *See* Hoffman, A.L., 3:45876
Lowery, G.W., Solar energy research facility at the University of Texas at Arlington, 3:44410 (CONF-761220—, pp 127)
See Beach, C.D., 3:44423
Lowery, V.W., *See* Omberg, R.P., 3:44693
Lowry, L.L., *See* Page, D.J., 3:44629
Lu, A., *See* Caldwell, D.O., 3:45560
Lucius, J.L., *See* Weisbin, C.R., 3:44737
Ludemann, C.A., *See* Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Ludwig, K.R., *See* Zielinski, R.A., 3:44220
Lueck, K., Determining the gross and net calorific value of gaseous fuels, 3:44190
Lueke, D., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Luengo, C.A., *See* Sereni, J.G., 3:45028
Luessem, H., Oxidation of ecologically relevant substances in effluents and water, 3:45336
Lueth, V., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Luitwieler, S.H. Jr., Nuclear radiation measuring method and apparatus having blanking time inversely related to count rate, 3:45259
Lukens, L.L., Solar powered irrigation: present status and future outlook, 3:44468 (SAND—78-0016C)
Lukomskii, V.P., Nonlinear charge-density waves in a bounded magnetized plasma, 3:46063
Lukovenko, V.I., *See* Volkov, A.D., 3:44906
Lumpkin, M.E., One-dimensional Kapitza conductance: Comparison of the phonon mismatch theory with computer experiments, 3:45556
Luna, R.E., *See* Smith, D.R., 3:44272
Lunde, P., *See* Henriques, F.C., 3:44548
Lunn, P.W., Development of an artificial viscosity function. Final report, 3:45283 (AD-A—048778)
Lupe, R., Geologic foundation for uranium resource assessment, Triassic Chinle Formation, Southeast Utah, 3:44237 (USGS-CIRC—753, pp 1-4)
Lusk, E.C., *See* Anderson, R.T., 3:44275
Luste, G.J., *See* Caldwell, D.O., 3:45560
Lutz, H., Multisource deposition rate control using a mass spectrometer as a sensing element, 3:45006
Lyarskii, P.P., *See* Likhachev, Yu.P., 3:45404
Lyczkowski, R.W., Characteristics and stability analyses of transient one-dimensional two-phase flow equations

and their finite difference approximations, 3:44820
Hydrodynamic modeling of fluidized-bed gasifiers and combustors, 3:44054 (UCID—17759)
Lynch, F.J., *See* Holland, R.E., 3:45731
Lynch, G.R., *See* Bell, J., 3:45567
Lynch, H.L., *See* Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Lyon, W.G., Thermodynamics of the lanthanide trifluorides. I. The heat capacity of lanthanum trifluoride, LaF_3 from 5 to 350°K and enthalpies from 298 to 1477°K, 3:44998
Lysne, P.C., Electrical response of relaxing dielectrics compressed by shock waves: The axial-mode problem, 3:44915
Electrical response of a slim-loop-ferroelectric ceramic compressed by shock waves, 3:45069
Lyubimov, V.B., *See* Angelov, N., 3:45589
Lyutov, S.I., *See* Angelov, N., 3:45589

M

Ma, E., Gauge models of the VV + AA type and their effective neutrino interactions, 3:45605
Macala, G.A., System approach to determine an optimal system for supplying industrial process hot water using solar energy, 3:44456 (CONF-761220—, pp 177-182)
Macbeth, P.J., Laboratory research on tailings stabilization methods and their effectiveness in radiation containment, 3:45314 (GJT—21)
Mack, M.E., Flash bulb, 3:45210
Mackie, P.R., Preliminary assessment of the presence of oil in the ecosystem at Ekofisk after the blowout, April 22—30, 1977, 3:44178
Macklin, R.L., *See* Raman, S., 3:45754
Madaras, R.J., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Madland, D., *See* Hoffman, G.W., 3:45702
Madonna, L.A., *See* Marks, J.R., 3:44436
Madsen, V.A., *See* Brown, V.R., 3:45792
Maeda, H., *See* Yamamoto, S., 3:45938
Magana, J.W., *See* Behrens, J.W., 3:45775
Magee, C.W., *See* Carlson, D.E., 3:45088
Magee, T.J., *See* Armistead, R.A., 3:46120
Maggiore, C., *See* Ogle, W., 3:45266
Magnani, N.J., *See* Traeger, R.K., 3:44153
Magnuson, J., *See* Witt, R., 3:45001
Mahaffey, R.A., *See* Golden, J., 3:45170
See Pasour, J.A., 3:45500
Mahajan, S., *See* Chin, G.Y., 3:45016
Mahon, R., Nonlinear generation of Lyman-alpha radiation, 3:45168
Maier, K., Simple method for rapid detection of hydrocarbon groups in petrol and exhaust gases, 3:44997
Maier, W.B. II, *See* Person, W.B., 3:45491
Makeev, V.V., *See* Baranov, D.S., 3:45571
Makogon, M.M., Single-frequency operation of a pulsed neodynmium-glass ring laser, 3:45205
Maksimenko, E.A., *See* Larikov, L.N., 3:45034
Malanify, J.J., *See* Close, D.A., 3:45766
Malbrough, D.J., Elastic scattering of positive pions on ^{16}O at 40.0 and 49.7 MeV, 3:45708
See Burman, R.L., 3:45697
Malecek, J., Solar heater and condenser, 3:44509
Malekzadeh, M., Effect of magnetically aligned powder on the magnetostriction of sintered rare earth—iron Laves phase compounds, 3:45022
Malerbi, B.W., *See* Acres, G.J.K., 3:44985
Malin, M.C., *See* Albee, A.L., 3:45476
Malins, D.C., *See* Anderson, J.W., 3:45417
Malkin, V.M., *See* Breizman, B.N., 3:46077
Malko, J.A., *See* Bell, J., 3:45567
Mamaev, S.G., Creation of fermion pairs by a nonstationary gravitational field, 3:45860
Mamidzhanyan, E.A., *See* Azaryan, M.O., 3:45579
Mandenhall, G.D., *See* Barker, J.R., 3:45298
Manders, P.M., Energy supply and demand forecasts - an overview, 3:44874 (CONF-760688—, pp 25-79)
Manderscheid, P.H., Anchoring assembly, 3:44156
Manelas, A.J., Solar cell electric and heating system, 3:44370
Mangano, J.A., *See* Srivastava, B.N., 3:45163, 3:45164
Manheimer, W.M., *See* Chu, K.R., 3:45890
Mani, H.S., *See* Balachandran, A.P., 3:45672
Manley, O.P., Space-time approach to the Vlasov—Poisson equations, 3:46043
Mann, A.K., *See* Wanderer, P., 3:45570
Mann, K.H., Long-term effects of oil spills on marine intertidal communities, 3:44184
Mann, L.G., *See* Struble, G.L., 3:45747
Mannelli, I., *See* Cobb, J.H., 3:45559
Mannion, W.A., Catalytic reduction of oxides of nitrogen emissions into auto exhaust gas, 3:44982
Mansouri, F., *See* Chang, L.N., 3:45653
Manuccia, T.J., *See* Geosling, C.E., 3:44321
Manvi, R., Economics of internal and external energy storage in solar energy applications, 3:44559 (CONF-761220—, pp 25)
Mao, H.K., Specific volume measurements of Cu, Mo, Pd, and Ag and calibration of the ruby R_1 fluorescence pressure gauge from 0.06 to 1 Mbar, 3:45270
Maple, M.B., *See* Sereni, J.G., 3:45028
Mar, R.W., *See* Bramlette, T.T., 3:44847
Marable, J.H., *See* Weisbin, C.R., 3:44737
Marchildon, L., *See* Guersey, F., 3:45646
Marciano, W.J., Parity violation in atoms induced by radiative corrections, 3:45614
Margen, P., Use of nuclear energy for district heating, 3:44728
Margolis, D.L., Analytical study of intake tuning for helical-rotor expanders, 3:45136 (UCRL—52449)
Marion, C.P., Method to produce synthesis gas, 3:44332
Markarian, R.K., Review of current interest and research in water hyacinth-based wastewater treatment. Final report, 3:44966 (N—77-33683)
Markos, G., *See* LaPoint, D.J., 3:44226
Marks, J.R., Solar energy coupled networks, 3:44436 (CONF-761220—, pp 329-336)
Marks, L.J., *See* Stewart, J.E., 3:45408
Marks, T., *See* Burman, R.L., 3:45697
See Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Markushin, V.E., *See* Kerbikov, B.O., 3:45856
Marquis, G.L., Method and apparatus for running and retrieving logging instruments in highly deviated well bores, 3:45277
Marriner, J.P., *See* Bell, J., 3:45567
Marsakov, V.A., Distribution of metals among the galactic populations and the evolution of the Galaxy, 3:45466
Marsh, D.O., *See* Clarkson, T.W., 3:45423
Marsh, S.J., Computer simulation studies of strong proton rings, 3:45882
Marshall, A.C., Physics analysis of an SFT fuel pin experiment in the ACPR, 3:44784 (SAND—77-1737)
Marston, C.H., *See* Cook, C.S., 3:44900
Martelli, A., SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles, 3:44696 (KFK—2483)
Martin, A., Optimisation of shielding for direct-cycle steam turbine plant, 3:44765
Martin, F., *See* Arnold, R.G., 3:45687
Martin, J.F., *See* Caldwell, D.O., 3:45560
See Jaros, J.A., 3:45561
Martin, T.G., Method for the hydrogenating extraction of coal, 3:44034
Martin, W.W., *See* Naudascher, E., 3:44189
Martinoli, P., *See* Clem, J.R., 3:45845
Martinska, G., *See* Amaglobeli, N.S., 3:45587
Martysh, E.V., *See* Kogan, E.Y., 3:46056
Maruyama, M., *See* Sugai, H., 3:46053
Masalov, V.L., *See* Koshilev, N.A., 3:45942
Masarskii, S.I., *See* Andreev, S.S., 3:45430
Mase, A., Measurements of dispersion relation of waves in a turbulently heated plasma by microwave scattering method, 3:46035 (IPPJ—291)
Mashkovitch, V.P., *See* Abagjan, A.A., 3:44769, 3:45824
Mashkovskii, A.G., *See* Ladikov, Y.P., 3:46015
Masri, Y.E., *See* Guidry, M.W., 3:45748
Mateer, R.S., *See* Copeland, G.L., 3:44282
Mather, W.B. Jr., *See* Durkin, J.A., 3:44170
Mathur, V.S., Neutral-current constraints on SU(2) x U(1) gauge theories, 3:45648
Matoba, T., Diagnostic planning in JT-60 project, 3:45902 (JAERI-M—7220)
See Itagaki, T., 3:45901
Matsonashvili, B.N., *See* Girich, B.G., 3:45186
Matsuda, Shinzaburo, Influence of error fields on the plasma confining field and the plasma confinement in tokamak, 3:46096 (JAERI-M—7103)
Matsui, H., Self-diffusion processes in nuclear carbonitrides UC/sub x/N/sub 1-x/ and $(U,Pu)C_{0.8}N_{0.2}$, 3:45091
Matsumoto, K., *See* Kiba, T., 3:44574
Matsunaga, T., *See* Hayami, H., 3:44595
Matsuura, K., *See* Ohkubo, K., 3:45934
Mattern, P.L., *See* Fairchild, R.G., 3:45828, 3:45829
Mattes, M., *See* Caglioti, E., 3:45817
Matthews, D.L., Anomalous spectral and yield features of Auger emission from symmetric molecules, 3:45510
See Jamison, K.A., 3:45532
Mattson, J.P., Solar energy collector, 3:44516
Solar energy heat collector, 3:44514
Matzke, J., *See* Matsui, H., 3:45091
Max, C.E., *See* Bernstein, I.B., 3:45954
May, M., *See* Cester, R., 3:45576
Mayer, F.J., *See* Campbell, P.M., 3:46116
See Cover, R.A., 3:45906
See Osborn, R.K., 3:46117
Mayo, D.W., Weathering characteristics of petroleum hydrocarbons deposited in fine clay marine sediments, Searsport, Maine, 3:45333
Mazur, V.A., Suppression of the Alfven instability in a two-component tokamak of noncircular cross section, 3:46060
Mazzucato, E., Low-frequency microinstabilities in the PLT tokamak, 3:45884
McAdams, H.T., Fuel economy of automotive vehicles: a compendium of statistical techniques, 3:44952 (HCP/M6037—01)

McArthur, D.P., Deposition and distribution of lead, phosphorus, calcium, zinc, and sulfur poisons on automobile exhaust NO/sub x/ catalysts, 3:44986
McBride, J.B., Stability of neoclassical EBT operating points, 3:46009
McCain, B.B., Bioavailability of crude oil from experimentally oiled sediments to English sole (Parophrys vetulus), and pathological consequences, 3:45377
McCarthy, J.S., *See* Arnold, R.G., 3:45687
See Lichtenstadt, J., 3:45758
McCarthy, K., *See* de Vellis, J., 3:45371
McCarthy, K.D., Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3':5'-cyclic monophosphate levels in primary cultures of glia, 3:45367 (UCLA—12-1145)
McCarthy, R.L., *See* Fisk, R.J., 3:45575
McCarty, R.D., A comparison of mathematical models for the prediction of LNG (liquefied natural gas) densities, 3:44198 (PB—276047)
McClelland, J.G., *See* Nasser, M.A., 3:45573
McClelland, S.D., *See* Amos, J.C., 3:44691
McCown, D.L., *See* Harrison, W., 3:45327
McCredie, J., Influence of design and regulatory code changes on a 'repeat' project - Pickering G.S. 'B', 3:44679 (CONF-760688—, pp 1-26)
McDaniel, D.H., *See* Shope, S., 3:45248
McDaniel, E.W., *See* Pope, W.M., 3:45093
McDaniel, R.D., *See* Wilson, W.F., 3:44212
McDaniels, D.K., *See* Hoffman, G.W., 3:45702
McEligot, D.M., *See* Picket, P.E., 3:45242
McEvoy, J.E., Catalysts for the control of automotive pollutants, 3:44981
McFarlane, R.A., *See* Wolga, G.J., 3:45159
McGahee, N.W., *See* Gray, L.W., 3:45115
McGinnis, J.F., *See* de Vellis, J., 3:45371
McGoldrick, P.R., Data Director system manual, 3:46142 (UCID—17749)
McGrath, P.E., *See* Sprung, J.L., 3:44811
McGrory, J.B., *See* Nathan, A.M., 3:45724
McGuire, J.C., Tritium permeation through oxidized 304 and 316 stainless steel, 3:44694 (HEDL-SA—1326)
McIlrath, T.J., *See* Mahon, R., 3:45168
McKay, H.A.C., Separation and recycling of actinides: a review of the state of the art, 3:44279 (EUR—5801)
McKay, M.D., *See* Bement, T.R., 3:44216
McKeen, T.R., Solar energy collector, 3:44508
McKensie, B.J., *See* Wilson, W.F., 3:44212
McLaughlin, W.T., *See* Budinger, T.F., 3:45393
McLean, E.A., *See* Stamper, J.A., 3:45914
McLemore, D.R., Automatic surface flaw inspection of nuclear fuel pellets, 3:44260 (HEDL-SA—1409)
McLeod, N.B., Foreign uranium supply. Final report, 3:44276 (EPRI-EA—725)
McMaster, W.H., *See* Glenn, L.A., 3:44818
McMordie, R.K., Analytical model of flat plate solar collectors, 3:44484 (CONF-761220—, pp 97-98)
McMorran, P.D., *See* Moeck, E.O., 3:44664
McNamara, T.J., Solar energy system for domestic hot water heating, 3:44461 (CONF-761220—, pp 183-185)
McNeese, L.E., Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL—5387)
McNeilly, C.E., Automatic range selector, 3:45276
McNicol, B.D., Method for preparing fuel cell catalysts, 3:44914
McNulty, K.J., *See* Harland, J.R., 3:44061
McVeigh, J.C., Brighton Polytechnic Integrated Solar Dwelling (ISD), 3:44411 (CONF-761220—, pp 129-133)
Mdivani, V.N., *See* Alferov, Z.I., 3:45194
Mecking, B.A., *See* Arnold, R.G., 3:45687
Medley, S.S., Energetic ion mass analysis using a radio-frequency quadrupole filter, 3:45912
Medvedev, B.I., Boson approximation in deformed atomic nuclei, 3:45785
Medvedev, V.K., *See* Gupalo, M.S., 3:45036
Mei, J.S., Fluidized-bed combustion test of low-quality fuels: Texas lignite and lignite refuse, 3:44134 (MERC/RI—78/3)
Meisel, K., *See* Voigt, A., 3:45121
Mekjian, A.Z., Explosive nucleosynthesis, equilibrium thermodynamics, and relativistic heavy-ion collisions, 3:45442
Mel'nikova, N.N., *See* Angelov, N., 3:45589
Melent'ev, L.A., *See* Dollezhal', N.A., 3:44721
Melvin, J.W., *See* Culver, R.H., 3:45386
Mendelsohn, S.L., Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer, 3:45375 (UR—3490-1379)
Menon, M.M., *See* Whealton, J.H., 3:46103
Merkle, J.G., Development of the tangent modulus method of elastic-plastic fracture analysis, 3:44754 (IAEA—18; CONF-751268—, pp 407-460)
Evaluation of the HSST program intermediate pressure vessel tests in terms of light-water-reactor pressure vessel safety, 3:44643 (IAEA—18; CONF-751268—, pp 33-80)
Merritt, F.S., Neutral-current coupling in high-energy neutrino interactions, 3:45569
Merritt, W.F., Fixation of radioactive waste in glass, 3:44278 (AECL—5800, pp 81-85)
Messier, M., *See* Delaney, J.B., 3:44711
Messing, F., *See* Wanderer, P., 3:45570
Meulenberg, A. Jr., Radiation hardened P-I-N and N-I-P solar cells, 3:44375
Mewissen, L., *See* Staveloz, P., 3:45770
Meyer, G., Method for producing a stabilized electrical superconductor, 3:45143
Meyer, H., *See* del Papa, C., 3:45611
Meyer, R.A., Multiparticle configurations in the odd-neutron nuclei ^{61}Ni and ^{67}Zn populated by decay of ^{61}Cu, ^{67}Cu, and ^{67}Ga, 3:45730
See Heyde, K., 3:45737
Meyer-Schuetzmeister, L., Lifetime and γ decay of the isomeric $19/2^-$ state in ^{43}Ti, 3:45722
Meyers, R.E., *See* Hercher, M., 3:45181
Mezentsev, A.P., Optical excitation function of the 5876-A line in helium near the threshold, 3:45514
Mezilev, K.A., *See* Batist, L.K., 3:45580
Michael, P.L., Evaluation of experimental and developmental communication systems used in underground coal mines. Performance of trapped-miner communication system. Final report, 1 April 1976—31 January 1977, 3:44100 (PB—274683)
Michael, W., *See* Scharre, D.L., 3:45581
Michaelis, T.D., Design definition of a mechanical capacitor. Final report, June 1976—April 1977, 3:44838 (N—77-33603)
Michel, L., *See* Herziger, G., 3:45936
Michels, H.H., *See* Green, T.A., 3:45506
Middleton, R., *See* Alburger, D.E., 3:45698
Midzuno, Y., *See* Sugihara, R., 3:46036
Miettinen, J.K., Accumulation and excretion of heavy metals in organisms, 3:45378
Migdal, A.B., Vacuum polarization in strong fields and pion condensation, 3:45789
Mihu, R., Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag, 3:45744
Mika, J., *See* Blenski, T., 3:44735
Mikaelyan, L.A., Limitations on the parameters of the superdense state of nuclei, 3:45786
Mikhailov, Y.V., *See* Antipov, Y.M., 3:45586
Mikhailov, Yu.A., *See* Basov, N.G., 3:46124
Mikhailovskii, A.B., Theory of "drift" thermonuclear instabilities in a tokamak reactor, 3:46014
See Mazur, V.A., 3:46060
Miley, G.H., Direct nuclear pumped lasers: status and potential applications, 3:45215
Milgram, M.S., Tables of the isotopic composition of transuranium elements produced in Canadian D_2O moderated reactors, 3:44675 (AECL—5904)
Millener, D.J., Note on recoupling coefficients for SU(3), 3:45810
Miller, C.G., Portable linear-focused solar thermal energy collecting system, 3:44549
Miller, C.W., Evaluation of models used for the assessment of radionuclide releases to the environment. Progress report, April 1976—December 1977, 3:45317 (ORNL—5382)
Miller, D.H., *See* Jaros, J.A., 3:45561
Miller, G.L., Control and optimization of solar water heating systems in univeristy buildings, 3:44462 (CONF-761220—, pp 187-188)
Miller, H.N., Additive for petroleum distillates, 3:44191
Miller, J.M., Energy and spin dependence of fission: ^{1}H and ^{4}He emission from ^{194}Hg compound nuclei, 3:45751
Miller, W.F. Jr., Transport and reactor theory. Progress report, January 1—March 31, 1978, 3:44734 (LA—7271-PR)
Miller, W.H., Resonance effects in the semiclassical theory of electronically nonadiabatic collision processes, 3:45528
Mills, A.L., *See* Colwell, R.R., 3:45409
Mills, G.S., Evaluation of plasma arc welding capabilities and applications, 3:45134 (RFP—2722)
Mills, W.L., Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL—13832)
Millsap, D.A., *See* Harker, Y.D., 3:44785
Miloshenko, V.E., Electrostatic interaction between dislocations in a superconductor, 3:45841
Min, S., Comparison of coal beneficiation methods, 3:44123 (IS-ICP—50)
Minardi, E., Bifurcated tokamak equilibria related to the shrinking and the disruption of the current, 3:46101
Minear, R.A., *See* Patterson, J.W., 3:45351
Mineev, V.P., *See* Volovik, G.E., 3:45555
Mineneko, E.V., Surface superconductivity in layered compounds, 3:45839
Minkel, K.J., *See* Stephens, D.R., 3:44055
Mir-Kasimov, R.M., *See* Amirkhanov, I.V., 3:45674
Miranskii, V.A., Infrared singularities and suppression of bosons in massless Abelian gauge theory, 3:45675

Mirels, H., Boundary layer effects in chemical laser nozzle inlet. Interim report, 3:45157 (AD-A—048447)
Miroshnichenko, I.I., Multiple analysis of single-pion photoproduction in the region of the P_33 resonance, 3:45607
Mishustin, I.N., *See* Galitskii, V.M., 3:45790
Mistry, D.K., Development of a continuous dry coal screw feeder: Phase II. Quarterly technical progress report, April 1, 1977—June 30, 1977, 3:44038 (FE—1794-25)
Misyakov, P.Y., *See* Burakov, V.S., 3:45917
Mitchell, D.H., *See* Moore, R.H., 3:44031
Mitchell, G.W., *See* Holtzscheiter, E.W., 3:44324
Mitchell, K.B., Energy-transport experiments in 10-μm laser-produced plasmas, 3:45909
Mitchell, M.M. Jr., *See* Doelp, L.C., 3:44994
Mitchell, R.J., Multilevel crossing rates for automated signal classification, 3:44732 (CONF-780403—3)
Mitchner, M., *See* Bender, D.J., 3:45508
Mitrofanov, I.G., *See* Dolginov, A.Z., 3:45447
Mitryaev, A.A., High-frequency conductivity of thin single-crystal tungsten wafers in a strong magnetic field, 3:45050
Mitsai, Y.N., Effect of resonance oscillations of the order parameter on the tunnel current in superconductors, 3:45840
Mitsuhashi, T., *See* Ichikawa, Y.H., 3:46039
Mitsuk, V.E., *See* Gudilin, I.A., 3:45987
Mittermeier, F., Solar plant and large-scale store for office buildings. Operational experience confirms: 42 m^2 collector area and a 15 m^3 store save 6,800 l heating fuel oil annually, 3:44449
Miyahara, A., *See* Akaishi, K., 3:46133
Miyahara, T.F., *See* Berman, P.A., 3:44360
Miyakoshi, J., *See* Tsubosaka, A., 3:44792
Miyama, N., *See* Idehara, T., 3:46032
Miyamoto, K., Recent stellarator research, 3:46088
See Fujiwara, M., 3:45948
See Ohasa, K., 3:46097
Miyasaka, S., *See* Oka, Y., 3:44707
Miyoshi, S., *See* Kawabe, T., 3:45892
Mizumoto, M., *See* Raman, S., 3:45754
Mlavsky, A.I., Encapsulated solar cell assembly, 3:44371
Mochel, J.M., *See* Smaardyk, J.E., 3:45252
Mody, K.J., *See* Oezlsik, M.N., 3:44563
Modzolevskii, V.I., *See* Komel'kov, V.S., 3:45986
Moeck, E.O., Dynamic simulation of a reboiler, 3:44664 (AECL—5680)
Moeller, J., *See* Braetter, P., 3:45108
Moeller, P., *See* Negele, J.W., 3:45765
Moerzer Bruijns, N.F., Fatal flights of birds against windows, 3:45366 (ORNL-tr—4618)
Moffatt, G.I., *See* Bell, J., 3:45567
Moffeit, K.C., *See* Chadwick, G.B., 3:45585
Moffett, D., Disposal of solid wastes and liquid effluents from the milling of uranium ores, 3:44289 (CANMET—76-19)
Mogilnicka, E.M., Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat, 3:45420 (ORNL-tr—4594)
Mohapatra, R.N., CP violation in left-right—symmetric gauge theories and possible existence of absolutely stable hadrons, 3:45650
Symmetry breaking and naturalness of parity conservation in weak neutral currents in left-right—symmetric gauge theories, 3:45649
Mohindra, V.K., *See* Okazaki, A., 3:44672
Mohn, N.C., *See* Hale, G.L., 3:44037
Mohri, A., New lens system using toroidal magnetic field for intense ion beams, 3:46107 (N—77-33981)
Mohrmann, H., Large-volume sampler for submicroscopic aerosol particles, 3:45239
Moinester, M.A., *See* Malbrough, D.J., 3:45708
Moiseev, S.S., *See* Erokhin, N.S., 3:46074
Molinari, V.G., *See* Boffi, V.C., 3:45819
Molodenskii, M.M., Magnetic fields of active regions and their zero points, 3:45459
Molvig, K., *See* Hutchinson, I.H., 3:45886
Monahan, J.E., Nuclear mass relations and equations, 3:45782
Moneti, G.C., *See* Cobb, J.H., 3:45559
Monier, G., Use of pneumatics by Houilleres de Provence, 3:44111
Monjes, J.A., *See* Storm, E.K., 3:46118
Monsay, E., *See* Babcock, J., 3:45629
Monsay, E.H., *See* Olsson, M.G., 3:45598
Montford, B., Techniques to reduce radiation fields, 3:44797 (CONF-760688—, pp 41-58)
Montizaan, J., *See* McKay, H.A.C., 3:44279
Moon, R.L., *See* Nelson, N.J., 3:44366
Mooney, J.J., *See* Mannion, W.A., 3:44982
Mooradian, A., Tunable laser spectral survey of molecular air pollutants. Final report, 3:45302 (PB—276188)
Moore, R.H., Process for cleaning and removal of sulfur compounds from low Btu gases. Quarterly summary report, January—March 1978, 3:44031 (PNL—2040-9)
Moore, S.E., *See* Rodabaugh, E.C., 3:44760
Moore, W.H., *See* Struble, G.L., 3:45747
Mooring, F.P., *See* Schiffer, J.P., 3:45558
Moreau, C., *See* Lefort, G., 3:45151
Moretto, L.G., *See* Wozniak, G.J., 3:45760
Morev, A.A., *See* Gusev, N.Z., 3:44071
Morgan, J.D. III, Asymptotic behavior of bound eigenfunctions of Hamiltonians for single-variable systems, 3:45853
Morgret, R., *See* Weber, M.J., 3:45090
Mori, M., View toward the disposition of retired nuclear power stations, 3:44833 (ORNL-tr—4660)
Morimoto, Giroshi, Method for the separation of styrene from thermally cracked petroleum, 3:44173
Morioka, S., *See* Shiobara, K., 3:45054
Morison, W.G., Heavy water nuclear station design, 3:44680 (CONF-760688—, pp 1-32)
Moroz, L.G., *See* Amaglobeli, N.S., 3:45587
Morozov, A.I., Superconductivity in two-component compounds. The isotope effect in PdH, 3:45075
Morozov, V.M., Diagnostics of beams of accelerated (runaway) electrons in tokamaks, 3:45923
Morris, C.L., *See* Zeidman, B., 3:45700
Morris, T.C., *See* Miller, G.L., 3:44462
Morris, W.A., *See* Sharp, R.R. Jr., 3:44215
Morris, W.F., *See* Stephens, F.B., 3:45303
Morrison, R.J., *See* Caldwell, D.O., 3:45560
Moshchennikov, Y.V., *See* Batishche, S.A., 3:45193
Mosher, D., Intense focussed ion beams and their interaction with matter. Interim report, 3:45933 (AD-A—048753)
Moskalenko, E.M., Use of polymer solution for consolidation of coal seams, 3:44140
Moskalev, A.N., Effects of parity nonconservation on the inelastic scattering of leptons by nuclei ($0^+ \rightarrow 0^-$ transition), 3:45806
Moskvin, S.I., *See* Vinnikov, L.Y., 3:45049
Moss, L., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Mostepanenko, V.M., *See* Mamaev, S.G., 3:45860
Mostovnikov, V.A., *See* Batishche, S.A., 3:45193
Motkin, V.S., *See* Batishche, S.A., 3:45193
Motulevich, G.P., *See* Vedeneev, S.I., 3:45037
Moul, E.T., *See* Hampson, G.R., 3:44182
Mouzourakis, P., *See* Cobb, J.H., 3:45559
Moxham, R.M., *See* Tanner, A.B., 3:44227
Mozley, R., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Mraz, F.R., Gastrointestinal absorption and distribution of ^{144}Ce in the suckling pig, 3:45405
Muehlbauer, W., Solar grain drying, 3:44460
Mueller, B., New type dual storage unit for solar water heating, 3:44464
Mueller, D., *See* Struble, G.L., 3:45747
Mueller, W., *See* Hercher, M., 3:45181
Mueller-Dietsche, W., Project 'HDR safety programme'. A survey, 3:44826
Mueller-Duysing, W., *See* Heinzel, F., 3:45830
Muellner, P., *See* Clark, B.E., 3:44317
Mukherjee, S.N., *See* Rawitscher, G.H., 3:45728
Mukhin, V.V., *See* Erokhin, N.S., 3:46074
Mullani, N.A., *See* Phelps, M.E., 3:45383
Mullens, M.C., Bibliography of the geology of the Green River Formation, Colorado, Utah, and Wyoming, to March 1, 1977, 3:44199 (CIRC—754)
Muller, R.E. Jr., Developing an energy input-output simulator (AGNRG) for analysis of alternative cropping systems in the Corn Belt (energy in agriculture), 3:44855 (PB—274094)
Mulligan, L., *See* Alburger, D.E., 3:45698
Muranova, G.A, Dependence of the index of refraction and microporosity of zirconium dioxide films on the deposition conditions, 3:45062
Murdock, S.M., Fatigue life of LOFT Class I pipe welds, 3:44782 (LTR—11-20(Rev.B.))
Murina, T.M., *See* Goncharov, N.I., 3:45985
Murphy, F.V., *See* Caldwell, D.O., 3:45560
Murphy, H.C. Jr., Process of hydrodesulfurization and separate solvent extraction of distillate and deasphalted residual lubricating oil fractions, 3:44171
Murphy, M.J., Mass and low-lying levels of ^{67}Ge; trends in the structure of / sup 63,65/Ni, /sup 65,67/Zn, and / sup 67,69/Ge, 3:45732
See Davids, C.N., 3:45721
See Norman, E.B., 3:45729
Murphy, R.P., Log-inject-log in sand consolidation, 3:44147
Murphy, T.D., Overview of the activated corrosion product reduction program for US power reactors, 3:44828
Murray, T.M., University of Louisville Dual Solar Energy Research Center, 3:44412 (CONF-761220—, pp 135-136)
Murray, T.M. Jr., *See* Calhoun, J.H., 3:44437
Murthy, K.P.N., Direction dependent exponential biassing in Monte Carlo simulation of radiation transport in thick shields, 3:45813
Musgrove, P.J., Vertical axis wind turbines, 3:44603
Mushotzky, R.F., X-ray emitting galaxy Can-A, 3:45451 (N—77-34092)

Musinski, D.L., *See* Henderson, T.M., 3:44318
Musyal, S.A., *See* Eremin, I.V., 3:44080
Muzinich, I.J., *See* Appelquist, T., 3:45670
Myers, M.S., *See* McCain, B.B., 3:45377
Myers, S.M., Ion-beam investigation of Sb diffusion and solubility in Fe, 3:45023
Myers, W.A., *See* Meyer, R.A., 3:45730
Myshalov, P.I., *See* Batishche, S.A., 3:45193

N

Nad', F.Y., *See* Latyshev, Y.I., 3:45044
Nagami, M., *See* Yamamoto, S., 3:45938
Nagel, D.J., *See* Bleach, R.D., 3:45908
Nagel, P., *See* Petrovich, F., 3:45794
Nagy, F., *See* Chadwick, G.B., 3:45585
Nagy, J., *See* Angelov, N., 3:45589
Nakahara, S., *See* Chin, G.Y., 3:45016
Nakajima, F., *See* Kawagoshi, H., 3:44162
See Otani, K., 3:44626
Nakamura, K., *See* Cobb, J.H., 3:45559
Nakamura, T., *See* Terai, R., 3:44300
Nakano, H.H., *See* Kligler, D., 3:45173
Nakase, T., *See* Hattori, T., 3:44974, 3:44976, 3:44978
Nanbu, T., *See* Terai, R., 3:44300
Nann, H., *See* Hoffman, G.W., 3:45702
Nappi, A., *See* Cobb, J.H., 3:45559
Narayan, J., Comparative study of laser and thermal annealing of boron-implanted silicon, 3:45102
p-n junction formation in boron-deposited silicon by laser-induced diffusion, 3:44362
See Young, R.T., 3:45087
Narodetskii, I.M., *See* Baryshnikov, A.G., 3:45787
See Grach, I.L., 3:45677
Nasby, R.D., *See* Berg, R.S., 3:44373
Nash, J.T., Speculation on three possible modes of emplacement of uranium into deposits of the Midnite Mine, Stevens County, Washington, 3:44250 (USGS-CIRC—753, pp 33-34)
Nash, T., *See* Caldwell, D.O., 3:45560
Nash, T.J., *See* Otter, K.J., 3:44104
Naskidashvili, I.A., Low-temperature NMR investigation of zirconium hydride, 3:45064
Nasser, M.A., p-^{4}He elastic scattering at 5.75 GeV/c, 3:45573
Nathan, A.M., Structure in the Radiative Capture of ^{12}C by ^{12}C near the coulomb barrier, 3:45701
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
Nathan, O., *See* Christensen, P.R., 3:45745
Naudascher, E., Acoustic leakage detection in pipelines, 3:44189 (ANL-Trans—1131)
Naumann, R.A., *See* Struble, G.L., 3:45747
Naumenko, P.A., *See* Burakov, V.S., 3:45917
Naus, D.J., Monitoring of prestressed concrete pressure vessels. 1. An overview of concrete embedment strain instrumentation and calibration test results for selected concrete embedment strain meters, 3:44761 (ORNL/TM—6191/V1)
Nayfeh, M.H., Radiative collision-induced photoionization, 3:45533
Nazargulov, R.M., *See* Angelov, N., 3:45589
Nazli, M., *See* Yuan, S.W., 3:44561
Neal, W.R., Method and apparatus involving the generation of x-rays, 3:44323
Nealey, S.M., *See* Rankin, W.L., 3:44296
Nease, D., *See* Barish, B.C., 3:45566
Nechaev, S.V., *See* Burakov, V.S., 3:45917
Nedospasov, A.V., Physics of MHD generators, 3:44899
Needham, C.E., *See* Lunn, P.W., 3:45283
Nefed'ev, V.P., *See* Uralov, A.M., 3:45462
Nefedov, Yu.A., Study of the physicochemical properties of activated coke, 3:44084
Negele, J.W., Dynamics of induced fission, 3:45765
Pion-exchange contributions to charge densities of closed-shell nuclei, 3:45691
Neil, B.C.J., Contribution of fission products to radiation fields in a pressurized heavy water reactor, 3:44683
Neilsen, F., Draft environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company, 3:44329 (DES—77-1)
Nelson, G.C., Combined low-energy ion scattering and x-ray photoelectron spectroscopy study of Ta_2O_5 bombarded by 500—3000-eV He ions, 3:45063
Nelson, J.V., *See* Ombrellaro, P.A., 3:44780
Nelson, N.J., Organometallic-sourced VPE AlGaAs/GaAs concentrator solar cells having conversion efficiencies of 19%, 3:44366
Nelson, W.E., Homemade nuclear bomb syndrome, 3:44316
Nemashkalo, A.A., Electroexcitation of giant multiple resonances in ^{64}Zn and ^{124}Sn nuclei, 3:45735
Nemenov, L.L., *See* Berezhnev, S.F., 3:45696
See Kravtsov, A.V., 3:45608
Neronov, Y.I., NMR determination of the triton-proton magnetic moment ratio to within 10^{-6}%, 3:45517
Nesmelova, I.M., *See* Bratashevskii, Y.A., 3:45097
Nesterenko, L.L., *See* Biryhkov, Yu.V., 3:44077
Nethaway, D.R., Half-life of ^{92}Nb/sup g/, 3:45741
See Chapman, T.C., 3:45777
Neufeld, R.D., Preliminary evaluation of the biological oxidation of thiocyanates. Progress report, November 30, 1977—February 28, 1978, 3:44085 (COO—4502-2)
Neugroschel, A., Emitter current suppression in a high-low-junction emitter solar cell using an oxide-charge-induced electron accumulation layer, 3:44365
Neuhaus-Schwermann, A., Energy extraction from vegetative fuels: wood gasification, 3:44340
Nevinnyi, Y.A., *See* Bobykin, B.V., 3:45038
Newbury, R.S., *See* Behrens, J.W., 3:45775
Newman, B.M., *See* Warman, E.A., 3:44830
Newnam, B.E., Damage resistance of coated optics for pulsed CO_2 lasers, 3:45166 (LA-UR—78-931)
Newsom, C.R., *See* Riley, P.J., 3:45704
Newsom, M.M., Geothermal well technology: drilling and completions program plan, 3:44596 (SAND—77-1630)
Newsom, R., *See* Snapp, P.C., 3:44645
Newton, M.D., *See* Binkley, J.S., 3:45544
Nezrick, F.A., *See* Bell, J., 3:45567
Nguyen, H.K., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
NiCastro, J.R., Overview of the M.A.I.T. analysis system (machine analysis of the internal threat), 3:44314 (UCRL—81005)
Nicholas, W.R., Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
Nicholson, H., *See* Alston-Garnjost, M., 3:45583, 3:45584
Nickell, R.E., *See* Stone, C.M., 3:44813
Nicks, R., Shielding problems in the FINTOR design, 3:46093
See Caglioti, E., 3:45817
Nicolayeff, V., Tensile tests of 2500-kip prestressing tendons for the PCRV, 3:44656 (GA-A—14768)
Niechoda, Z., *See* Nowicki, M., 3:45191
Nieto, M.M., Exact wave-function normalization constants for the B_0 tanhz-U_0 cosh^{-} 2z and Poeschl-Teller potentials, 3:45498
Nikiforov, V.I., *See* Miroshnichenko, I.I., 3:45607
Nikitin, P.I., *See* Goncharov, N.I., 3:45985
Nikitin, Y.P., *See* Baranov, D.S., 3:45571
See Volkov, G.G., 3:45623
Nikitina, V.F., *See* Angelov, N., 3:45589
Nikolaev, M.I., *See* Girich, B.G., 3:45186
Nikolaeva, L.P., *See* Bagaev, S.A., 3:45515
Ning Yang, C., *See* Wang, L., 3:45665
Ninkovic, M.M., Analysis of external exposures of the personnel operating the RA reactor at Vinca for 1967—1976 period, 3:44788
Nishi-kawa, K.I., Nonlinear heat and particle transport due to collisional drift waves, 3:45950 (N—77-33996)
Nishihara, K., Thermonuclear reaction wave in high-density plasma, 3:45899
Nishikawa, K., *See* Tange, T., 3:45946
See Watanabe, M., 3:45989
See Watanabe, T., 3:45951
Nishimura, H., *See* Hasegawa, K., 3:45144
Nishimura, T., Development of a computer code for neutron streaming calculation in LMFBR, 3:44703
Nitsch, J., Estimation of characteristic periods for the development of energy-supply systems, 3:44879
Niu, K., *See* Yabe, T., 3:46080
Nix, J.R., *See* Negele, J.W., 3:45765
Noble, J.B., Improving regulatory effectiveness in Federal/State siting actions. Need for power: determinants in the state decisionmaking processes, 3:44712 (NUREG/CR—0022)
Noble, J.H., *See* Gans, D. Jr., 3:44823
Nobrega, E.G.O., *See* Lobo, P.C., 3:44485
Noda, T., Geochemical geothermal exploration in Noya geothermal field, 3:44587 (CONF-7610123—5)
See Koga, A., 3:44586
Noetzel, A.S., Conditions for product form network solution through the analysis of finite queues with overflows, 3:46134 (BNL—24181)
Nolan, J.E., Role and progress of the Clinch River Breeder Reactor Plant, 3:44688 (CONF-780440—1)
Nomi, M., *See* Kadoya, S., 3:44285
Nomiyama, K., Toxicity of cadmium: mechanism and diagnosis, 3:45424
Nomura, T., *See* Fujino, H., 3:45140
Noonan, J.R., LEED analysis of a Cu(110) surface, 3:45011
Nord, D.L. Jr., Characterization of fine-grained black uranium ores by transmission electron microscopy, 3:44248 (USGS-CIRC—753, pp 29-31)
Norman, E.B., Mass and β decay of the new neutron-rich isotope ^{60}Mn, 3:45729
See Davids, C.N., 3:45721
See Murphy, M.J., 3:45732
Norris, R.A., *See* Goldstein, N.E., 3:44579
Northam, D.B.C., *See* Mack, M.E., 3:45210
Northcliffe, L.C., *See* Riley, P.J., 3:45704
Northrop, D.A., Instrumentation and process control development for in

situ coal gasification. Twelfth quarterly report, September—November 1977, 3:44051 (SAND—78-0253)
Norton, R.C., Conceptual design for an atmospheric fluidized-bed direct combustion power generating plant. Phase I. Commercial plant conceptual design. Annual report, January 14, 1977—January 31, 1978, 3:44608 (FE—2583-13)
Notini, M., Long-term effects of an oil spill on Fucus macrofauna in a small Baltic bay, 3:44183
Notley, M.J.F., *See* Campbell, F.R., 3:44770
Novikov, V.A., *See* Vainshtein, A.I., 3:45673
Novikov, Y.N., *See* Batist, L.K., 3:45580
Novikshonov, V.I., *See* Vereshchagin, L.F., 3:45035
Nowicki, M., Acousto-optic Q switches for YAG:Nd lasers, 3:45191
Noyes, R., Cogeneration of steam and electric power, 3:44870
Nozaki, K., *See* Nishihara, K., 3:45899
Nwagha, H.N., *See* Johnson, A.I., 3:44429
Nyberg, G.L., *See* Carlson, T.A., 3:45271
Nyman, D.H., *See* McLemore, D.R., 3:44260

O

O'Connor, L.J., Total-field magnetic surveying as an exploration tool for sedimentary uranium deposits, 3:44242 (USGS-CIRC—753, pp 13-15)
O'Dell, R.D., *See* Miller, W.F. Jr., 3:44734
O'Neil, T.M., *See* Douglas, M.H., 3:45955
O'Neill, M.J., Solar concentrator and energy collection system, 3:44529
Obayashi, H., Report on radio frequency plugging research (3rd report), 3:45888 (UCRL-Trans—11347)
Oblow, E.M., *See* Weisbin, C.R., 3:44737
Ochelkov, Y.P., *See* Belovskii, M.N., 3:45464
Odajima, K., *See* Yamamoto, S., 3:45938
Oddone, P., *See* Chadwick, G.B., 3:45585
See Scharre, D.L., 3:45581
Odell, B.N., Blast forecasting guide for the Site 300 Meteorology Center, 3:45281 (UCID—17822)
Odian, A., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Oelrich, I.C., *See* Struble, G.L., 3:45747
Oezisik, M.N., Effects of internal circulation velocity and noncondensable gas on vapor condensation from a rising bubble, 3:44821
Oezlsik, M.N., Prediction of melting rate in a solar energy storage sub-system utilizing latent heat, 3:44563 (CONF-761220—, pp 45-46)
Offield, T.W., Computer-enhanced images and geologic studies, southern Powder River Basin, Wyoming, 3:44247 (USGS-CIRC—753, pp 27-29)
Oginets, O.V., *See* Bagaev, S.A., 3:45515
Ogino, O., *See* Fujino, H., 3:45140
Ogino, T., *See* Sanuki, H., 3:46033
Ogle, W., Ionization energy loss of relativistic electrons in thin silicon detectors, 3:45266
Ogorodnikov, D.D., Search for fractionally charged particles in sea water, ocean sediment deposits, and volcanic lava, 3:45557
Ohasa, K., Rotational transform angle of the stellarator field with twisted coils, 3:46097 (N—77-34016)
Ohkubo, K., Study on rf voltage breakdown for LHRH in 0.8 to 0.9 GHz, 3:45934 (N—77-33998)
Ohsawa, Y., Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves, 3:45874 (N—77-33983)
Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves, 3:46041 (N—77-34005)
See Ikezi, H., 3:46034
Ohtsuka, H., *See* Yamamoto, S., 3:45938
Ohwadano, Y., Simplified theoretical model of laser-produced spherical plasma, 3:46113
See Sato, K.N., 3:46122
Oiringel', I.M., *See* Kaplan, S.A., 3:45460
Oka, Y., Two-dimensional shielding benchmarks for sodium and iron at Yayoi, 3:44707
Okada, O., *See* Dodo, T., 3:46030
Okada, S., *See* Sato, K.N., 3:46122
Okamoto, K., Possibility of grasers using nuclear excitation by electron transition, 3:45220
Okamura, H., *See* Takashima, T., 3:46125
Okawa, E., *See* Terai, R., 3:45120
Okazaki, A., Flux distribution measurements in the Bruce A unit 1 reactor, 3:44672 (AECL—5833)
Okun', L.B., *See* Vainshtein, A.I., 3:45673
Okunevich, A.I., *See* Dmitriev, S.P., 3:45513
Okutsu, E., Effects of low frequency plasma waves on counter-streaming electron beam instability, 3:46029
Ol'shanetskii, L.G., *See* Bulashev, V.M., 3:44078
Olafsson, J., Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
Olascoaga, M.T., *See* Bennett, H.A., 3:44313
Olhoeft, G.R., Non-linear complex resistivity for the characterization of sedimentary uranium deposits, 3:44241 (USGS-CIRC—753, pp 12-13)
Olink, H., Glazing for transmitting solar radiation, 3:44537
Olins, A.L., Electron microscopy: a tool for visualizing chromatin, 3:45369 (CONF-780445—1)
Olins, D.E., Important hydrodynamic and spectroscopic techniques in the field of chromatin structure, 3:45370 (CONF-780445—2)
Olmer, C., *See* Paul, M., 3:45716
See Zeidman, B., 3:45700
Olness, J.W., *See* Nathan, A.M., 3:45724
Olsen, D.K., *See* Perez, R.B., 3:45720
Olsen, J.D., *See* Wagner, P., 3:44050
Olsen, T.G., Desiccant systems potential for cooling in humid climates, 3:44426 (CONF-761220—, pp 289-290)
Solar air conditioning for a school in Dade County, Florida, 3:44427 (CONF-761220—, pp 291-292)
Olson, W.O., *See* Wessol, D.E., 3:44731
Olsson, M.G., Electroproduction of low hadronic masses, 3:45598
Omberg, R.P., Design and economics of large LMFBRs, 3:44693 (HEDL-SA—1321)
Ombrellaro, P.A., Biases for current FFTF calculational methods, 3:44780 (HEDL-SA—1393)
Omel'yanchuk, A.N., *See* Kulik, I.O., 3:45146, 3:45843
Omori, S., *See* Cook, C.S., 3:44900
Oosthuizen, P.H., Prospects for energy from alternate sources in Canada, 3:44897 (CONF-760688—, pp 3-29)
Oothoudt, M.A., *See* Hoffman, G.W., 3:45702
Oppenheim, B.E., Reconstruction tomography from incomplete projections, 3:45387
Orel, A.E., *See* Rescigno, T.N., 3:45496
Oren, L., *See* Schwirzke, F., 3:45885
Ort, J.E., High quality methane gas through modified anaerobic digestion, 3:44337
Ortabasi, U., *See* Fehlner, F.P., 3:44534
Ortendahl, D., *See* Perez-Mendez, V., 3:45254
Ortiz, N.R., *See* Varnado, G.B., 3:44312
Osborn, R.K., Elementary analysis of fusion implosions, 3:46117
Osborne, D.W., *See* Lyon, W.G., 3:44998
Ossakow, S.L., Morphological studies of rising equatorial Spread F bubbles. Interim report, 3:45482 (AD-A—048752)
Ostapchenko, E.P., *See* Leontev, V.G., 3:45200
Ostenson, J.E., *See* Verhoeven, J.D., 3:45021
Ostroumov, V.I., *See* Berdnikov, Y.A., 3:45710
Ostrovskii, V.N., Asymptotic behavior of partial amplitudes in three-particle reactions with rearrangement of particles, 3:45800
Excitation of autoionization states by electrons near the threshold, 3:45543
Osypowski, E.T., *See* Olsson, M.G., 3:45598
Otaka, H., Method of processing radioactive vent gases, 3:44287
Otani, K., Waste flue gas desulfurizing method, 3:44626
Otter, K.J., Working the Threequarter seam at Markham colliery, with particular reference to the conveyor-mounted trepanner, 3:44104
Otto, R.J., Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
Otton, J.K., Geology of uraniferous tertiary rocks in the Artillery Peak-Date Creek basin, west-central Arizona, 3:44218 (USGS-CIRC—753, pp 35-38)
See Dooley, J.R. Jr., 3:44249
Ovakimova, N.K., *See* Vartanyan, Y.L., 3:45449
Ovchinnikov, S.G., *See* Kuz'min, E.V., 3:45073
Ovchinnikov, V.M., *See* Batishche, S.A., 3:45193
Overkamp, K.H., Zinc, its properties and its applicability for solar technology, 3:44554
Overmyer, R.F., *See* Macbeth, P.J., 3:45314
Owen, R.E., Surge behavior of UD cable systems. Final report, 3:44632 (EPRI-EL—720)
Owens, E.H., Mechanical dispersal of oil stranded in the littoral zone, 3:45334
Owens, J.F., Hadronic Y production, parton distributions, and quantum chromodynamics, 3:45593
See Glueck, M., 3:45626
Ozawa, T., *See* Takaesu, K., 3:44588

P

Packard, C., *See* Diamond, S., 3:44422
Paddock, R.A., Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes, 3:45360 (ANL/WR—77-3)

Page, D.J., Light-fired thyristor development. Interim report, 3:44629 (EPRI-EL—776)
Page, D.S., *See* Mayo, D.W., 3:45333
Paige, F.E., *See* Mohapatra, R.N., 3:45649
Painter, G.S., Bonding in a Cu (001) monolayer, 3:45025
Pak, N.K., Vacuum degeneracy and confinement in the massive Schwinger model, 3:45657
Pakvasa, S., *See* Ma, E., 3:45605
Palistrant, M.E., Effect of magnetic impurities and pressure on the critical temperature of a superconductor with an AuGa=-type band structure, 3:45047
Influence of a change in the topology of the Fermi surface on the coefficient of ultrasound absorption in superconductors, 3:45849
Palmadesso, P., *See* Haber, I., 3:46004
Palme, H.S., Evaluation of sample problem, case 1 - embedded flaw located in the Beltline Region wall of a PWR reactor vessel, 3:44649 (IAEA—18; CONF-751268—, pp 273-310)
Palmer, A.J., *See* Clark, W.M. Jr., 3:45158
Palmer, I.D., Shock-associated energetic proton events at large heliocentric distances, 3:45455
Palmer, R.B., *See* Cobb, J.H., 3:45559
Palmiotti, G., *See* Estiot, J.C., 3:44705
Palrang, M.T., *See* Dean, N.R., 3:45251
Palyukh, B.M., *See* Gupalo, M.S., 3:45036
Pan, V.M., Characteristics of electron spectrum and coupling constants in vanadium, 3:45043
Physical properties of vanadium in the temperature range 4.2—300 °K, 3:45042
Panarella, E., Comments on the paper by K.A. Brueckner and R.S. Janda 'Wavelength dependence of laser coupling to pellet implosions' Nucl. Fusion 17(2) (1977) 305, 3:46111
Panchenko, M.A., *See* Andreev, N.E., 3:46016
Panchenko, O.A., *See* Mitryaev, A.A., 3:45050
Pandolfo, J.P., *See* Henriques, F.C., 3:44548
Panrath, J., How much more CO_2 can we take, 3:45305
Pantelica, D., *See* Hellmeister, H.P., 3:45726
Pao, S.C., *See* Neugroschel, A., 3:44365
Pao, Y., Classical diffusion in large-aspect toroidal plasmas, 3:45881
Paoloni, F.J., Coupling to fast eigenmodes in a non-uniform plasma, 3:46046
Papadopoulos, K., *See* Haber, I., 3:46004
Papanicolas, C.N., *See* Lichtenstadt, J., 3:45758
Papee, D., *See* Gauguin, R., 3:44987
Parail, V.V., Absorption of the lower-hybrid wave in a bounded plasma, 3:46075
Interaction of lower hybrid waves with turbulent tokamak plasma, 3:46047
Kinetic theory of runaway electron beam instability in a tokamak, 3:46010
Pardo, R.C., *See* Davids, C.N., 3:45721
See Murphy, M.J., 3:45732
See Norman, E.B., 3:45729
Parfitt, A.W., Review of problems in nuclear industrial expansion, 3:44681 (CONF-760688—, pp 1-11)
Parker, A.J. Jr., Labor costs associated with solar equipment installation for commercial buildings, 3:44438 (CONF-761220—, pp 459-460)
Upton Community Multi-Purpose Center, Baltimore, Maryland, 3:44415 (CONF-761220—, pp 157-160)
Parker, C.D., *See* Fetterman, H.R., 3:45907
Parker, J.H. Jr., Superconducting generator design. Final report, 3:45139 (EPRI-EL—577)
Parker, L.W., Solar steam boiler, 3:44519
Parker, S.I., *See* Bell, J., 3:45567
See Jaros, J.A., 3:45561
Parks, A.D., *See* Sampson, D.H., 3:45531
Parks, E.K., *See* Sheen, S.H., 3:45526
Parks, L.A., *See* Petrovich, F., 3:45794
Parshikura, S.N., *See* Baranov, D.S., 3:45571
Parsons, S.D., *See* Muller, R.E. Jr., 3:44855
Parvez, A., Sensitivity analysis for shielding data evaluation by interactive graphics computing, 3:45823
Pasour, J.A., Reflex tetrode with unidirectional ion flow. Interim report, 3:45500 (AD-A—048751)
See Golden, J., 3:45170
Passella, J.R., Digital processor-based control for a solar monitoring and test station, 3:44434 (CONF-761220—, pp 321-323)
Pataraya, A.D., Excitation of an ion—acoustic soliton by high-frequency waves in a collisionless plasma with a two-temperature electron gas, 3:46066
Patel, G.N., *See* Patel, V.M., 3:45125
Patel, J.A., *See* Durkin, J.A., 3:44170
Patel, V.M., Radiation chemistry of polyethylene. XIV. Allyl radical decay kinetics in different types of polyethylene, 3:45125
Paterson, J.M., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Patten, B.G., *See* Clark, R.C. Jr., 3:45411
Patterson, J.F., *See* Flora, B.S., 3:44644
Patterson, J.W., Physical-chemical methods of heavy metals removal, 3:45351
Patton, R., *See* Weisberg, H., 3:45582
Paul, M., Resonant effects in the reaction $^{2}4Mg$ ($^{1}6O$,$^{1}2C$)$^{2}8Si$, 3:45716
Paul, R.N., *See* Yan, G., 3:44305
Pauletta, G., *See* Hoffman, G.W., 3:45702
Paulikas, G.A., Energetic electrons at the synchronous altitude 1974—1977. Interim report, 3:45485 (AD-A—048432)
Pavlovskii, A.I., *See* Tatsenko, O.M., 3:45071
Pawlicki, A.J., *See* Kramer, S.L., 3:45577
Payne, J.F., Pathological changes in a marine fish after a 6-month exposure to petroleum, 3:45416
Payne, M.G., *See* Nayfeh, M.H., 3:45533
Pearl, W.L., *See* Sawochka, S.G., 3:44647
Pearlstein, L.D., Finite Larmor radius equations in an arbitrary near-theta pinch geometry, 3:46001
See Freidberg, J.P., 3:46000
Peart, R.M., *See* Muller, R.E. Jr., 3:44855
Peck, C., *See* Chadwick, G.B., 3:45585
Pedersen, E.S., Nuclear power. Volume 1. Nuclear power plant design, 3:44636
Nuclear power. Volume 2. Nuclear power project management, 3:44637
Peelle, R.W., *See* Weisbin, C.R., 3:44737
Pelevin, O.V., *See* Girich, B.G., 3:45186
Penberthy, W.L., *See* Bayless, J.H., 3:44157
Penev, V.N., *See* Angelov, N., 3:45588
Penkuhn, H., *See* Caglioti, E., 3:45817
Penrose, W.R., *See* Vandermeulen, J.H., 3:45376
Pentecost, E.D., *See* Dvorak, A.J., 3:44088
Pepin, P., *See* Beslu, P., 3:44654
Pepper, C.S., *See* Steinman, D.K., 3:44235
Pepper, J.H., *See* Berk, J.V., 3:44938
Percy, J.A., Effects of chronic exposure to petroleum upon the growth and molting of juveniles of the arctic marine isopod crustacean Mesidotea entomon, 3:45415
Perez, R.B., Perturbation formalism for the complex poles and widths of the transition matrix with an application to intermediate structure phenomena, 3:45720
Perez-Mendez, V., Two detector MWPC position camera with honeycomb lead converters for medical imaging: performance and developments, 3:45254 (LBL—7205)
See Nasser, M.A., 3:45573
Perez-Navarro, A., Experimental device for the X-ray energetic distribution measurement in a tokamak plasma, 3:45903 (JEN—390)
Perino, A.M., *See* Lukens, L.L., 3:44468
Perkins, C.H., Solar heat collector system, parts therefor and methods, 3:44528
Perkins, R.A., Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June—31 August 1977, 3:45053 (FE—2299-15)
Perl, M.L., *See* Jaros, J.A., 3:45561
See Tanenbaum, W., 3:45602
Perroud, J.P., *See* Preedom, B.M., 3:45689
Perry, R.B., *See* Cox, C.W., 3:45268
Persiantsev, I.G., *See* Andreeva, M.N., 3:46019
Person, W.B., Absolute integrated intensities of the infrared absorption bands of $TiCl_4$, 3:45491
Peruzzi, I., Baryonic decays of the psi (3095), 3:45565
See Jaros, J.A., 3:45561
See Tanenbaum, W., 3:45602
Perveev, A.F., *See* Muranova, G.A, 3:45062
Peschmann, K., Electroradiographic device, 3:45257
Peskovatskii, S.A., Transition from relaxational to "Josephson" oscillations in shunted superconducting bridges, 3:45145
Peter, K., *See* Grams, W., 3:44026
Peters, H., *See* Dernedde, W., 3:44458
Peters, M.W., *See* Bell, J., 3:45567
Peters, W., Joint research work in the field of coal refining is carried out by the German coal mining industry, 3:44022
Peterson, A.H., Solar energy absorber, 3:44538
Peterson, D.B., Coal utilization and conversion technologies: state-of-the-art, 3:44135 (NP—23211)
Peterson, F., Uranium deposits related to depositional environments in the Morrison Formation (upper jurassic), Henry Mountains mineral belt of southern Utah, 3:44222 (USGS-CIRC—753, pp 45-47)
Peterson, R.E., *See* Ombrellaro, P.A., 3:44780
Peterson, R.J., *See* Sercely, R.R., 3:45692
Peterson, R.W., *See* Anderson, R.T., 3:44275
Peterson, V.Z., *See* Bell, J., 3:45567
Petersons, O., *See* Hillhouse, D.L., 3:44631
Petit, G., *See* Aubert, G., 3:44646
Petkov, S.T., *See* Bilen'kii, S.M., 3:45516
Petrick, M., *See* Dunn, P.F., 3:44902
Petrini, R.R., *See* Lord, D.E., 3:45224
Petroski, H.J., Computation of the weight function from a stress intensity factor, 3:44686 (ANL—77-82)
Petrov, I.P., *See* Artemov, K.P., 3:45713
Petrov, Y.V., Oklo natural nuclear reactor, 3:45778
Petrovich, F., Spin-orbit terms in heavy-ion elastic scattering potentials, 3:45794
Petrukhin, A.I., *See* Antipov, Y.M., 3:45586
Petschek, A.G., *See* Colgate, S.A., 3:45450
Pettigrew, M.J., Flow-induced vibration analysis of heat exchanger and steam generator designs, 3:44671 (AECL—5826)
Flow-induced vibration of nuclear power station components, 3:44673 (AECL—5852)
Pevgov, V.G., *See* Konev, Y.B., 3:45203

Pexton, R.L., Roots of two transcendental equations as functions of a continuous real parameter, 3:46145
Pfefferle, W.C., Catalytic combustion: a look back, a look forward, 3:45230 (CONF-771015—17)
Pfeifer, H.E., *See* Odell, B.N., 3:45281
Phelps, M.E., Some performance and design characteristics of PETT III, 3:45383
See Ter-Pogossian, M.M., 3:45382
Phillips, G.J., Future developments in nuclear power, 3:44716 (AECL--5800, pp 97-111)
Phillips, K.E., Granular bed filter development program. Quarterly report, July—September 1977, 3:44028 (FE—2579-13)
Phillips, M.E., Apparatus for the utilization of solar heat, 3:44518
Piccolo, M., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Picket, P.E., Convection in the closed Brayton cycle. Annual summary report No. 3, 1 April 1976—31 March 1977, 3:45242 (AD-A—047262)
Pickett, R.C., *See* Muller, R.E. Jr., 3:44855
Pickus, M.R., *See* Malekzadeh, M., 3:45022
Pieper, F.W., Organic heat transfer fluid for solar circuits, 3:44555
Pierre, F.M., *See* Tanenbaum, W., 3:45602
Pierson, C.T., *See* Dooley, J.R. Jr., 3:44249
Pierson, E.S., *See* Dunn, P.F., 3:44902
Pietrafesa, L.J., Continental margin atmospheric climatology and sea level (Historical setting 1974—1975), 3:45436 (SRO—902-8)
Pietsch, H.B., Symposium 'geology, mining and extractive processing of uranium, with special reference to Europe', 3:44256
Pigache, D., *See* Bonnet, J., 3:45190
Pikel'ner, L.B., *See* Alfimenkov, V.P., 3:45690
Piliya, A.D., *See* Gusakov, E.Z., 3:46018
Piller, W., *See* Schaefer, H., 3:44917
Pine, A.S., *See* Mooradian, A., 3:45302
Piotrowski, J.K., *See* Mogilnicka, E.M., 3:45420
Pipkin, F.M., *See* Bebek, C.J., 3:45562
Pirmatov, I.I., Unitarity condition and large-angle elastic scattering, 3:45645
Pis'mennyi, V.D., *See* Andreeva, M.N., 3:46019
Pitkin, J.B., How to plan an aerial gamma-ray survey, 3:44245 (USGS-CIRC—753, pp 19-20)
Pitz, W.J., Inhibition effects on extinction of polymer burning, 3:45129 (LBL—6898)
Plasil, F., Measurement of the energy division versus mass in highly damped reactions, 3:45746
Pleasant, J.C., *See* Killough, G.G., 3:45402
Pneuman, G.W., *See* Burlaga, L.F., 3:45478
Pochcial, J., Determination of the efficiency of the slow-burning stoves for solid fuels, 3:45232
Poettken, H.G., Energy utilization in steel production - present status and future possibilities, 3:44961
Pogutse, O.P., *See* Parail, V.V., 3:46010
Pohl, B., *See* Sidhu, G.S., 3:45826
Pohl, J.G., *See* Miller, C.G., 3:44549
Pohl, J.H., *See* Hardesty, D.R., 3:44136
Pohl, S., *See* Grams, W., 3:44026
Pokatilo, Y.M., Kinetics of accumulation of radiation defects in p-type germanium irradiated with 30 and 660 MeV protons, 3:45061
Polikarpov, M.I., Resonance-particle interaction amplitudes for arbitrary spins, 3:45633
Polishchuk, V.N., Scattering of high energy electrons by ^{65}Cu, 3:45736
Polito, J., *See* Newsom, M.M., 3:44596
Pollard, D.L., *See* Alston-Garnjost, M., 3:45583, 3:45584
Polovin, R.V., *See* Akhiezer, A.I., 3:46024
Polovnikov, S.A., *See* Antipov, Y.M., 3:45586
Polovov, V.M., Effect of plastic deformation on low-temperature specific heat and superconductivity of rhenium, 3:45041
Polushkin, K.K., *See* Egorov, Yu.A., 3:44827
Polushkin, V.M., *See* Andreeva, M.N., 3:46019
Polyarush, A.Y., *See* Baranov, D.S., 3:45571
Pon, G.A., Nuclear power reactor safety, 3:44793 (AECL—5694)
Ponomarev, L.I., *See* Vinitskii, S.I., 3:45521
Pontecorvo, B.M., *See* Bilen'kii, S.M., 3:45622
Ponti, C., *See* Nicks, R., 3:46093
Poortmans, F., *See* Staveloz, P., 3:45770
Pope, R.B., Parametric evaluation of heat transfer and coolant options for breeder reactor spent fuel shipping casks designs, 3:45153 (SAND—77-1415C)
Pope, W.M., Mobilities and longitudinal diffusion coefficients for Cs^+ ions in He and Ne gas, 3:45093
Pople, J.A., *See* Binkley, J.S., 3:45544
Popov, A.B., Parameters of terbium neutron resonances, 3:45752
Popov, V.K., *See* Bulashev, V.M., 3:44078
Popov, V.P., *See* Korenman, G.Y., 3:45801
Popova, V.M., *See* Angelov, N., 3:45589
Poppendiek, H.F., *See* Sabin, C.M., 3:44400
Porkolab, M., Parametric processes in magnetically confined CTR plasmas, 3:46011
Porter, R.W., *See* Wang, W., 3:44611
Poshchupkin, A.M., *See* Miloshenko, V.E., 3:45841
Poskanzer, A.M., *See* Westfall, G.D., 3:45707
Posnansky, M., Method and apparatus for heating a fluid medium by means of solar energy, 3:44521
Post, D.E., Steady-state radiative cooling rates for low-density, high-temperature plasmas, 3:45965
Post, R.F., *See* Fowler, T.K., 3:45895
Post, R.S., *See* Kamperschroer, J.H., 3:46106
Posylnyi, V.Ya., Question of the accuracy of the determination of the microhardness of anthracites, 3:44079
Poteat, L.E., Compatibility of materials in solar collectors, 3:44486 (CONF-761220—, pp 105-106)
Thermal testing of flat plate collectors, 3:44481 (CONF-761220—, pp 81)
Pothier, N.E., Valve maintainability in CANDU-PHW nuclear generating stations, 3:44676 (AECL—5913)
Poukey, J.W., Fast neutralization of ion beams in the presence of transverse magnetic fields, 3:45247
See Shope, S., 3:45248
Pouliot, H.N., Variable-displacement spark-ignition engine. Final report, 3:44973 (SAND—77-8299)
Powell, H.T., Photodissociation lasers using forbidden transitions of selenium atoms, 3:45172
Pozdnyakov, L.A., Effect of multiple Compton scatterings on an x-ray emission spectrum. Calculations by the Monte Carlo method, 3:45437
Pratt, J.C., *See* Hoffman, G.W., 3:45702
Pratt, R.E., *See* Castagnos, L.F. Jr., 3:44161
Preedom, B.M., $\pi^+ + d \rightarrow p + p$ reaction at 40, 50, and 60 MeV, 3:45689
See Burman, R.L., 3:45697
See Malbrough, D.J., 3:45708
Premuda, F., *See* Landini, P., 3:45818
Prentice, J.D., *See* Caldwell, D.O., 3:45560
Preobrazhenskii, N.G., *See* Bulyshev, A.E., 3:45919
Price, D.C., *See* Perez-Mendez, V., 3:45254
Price, R.J., *See* Hopkins, G.R., 3:46127
Price, W.G. Jr., *See* Gilai, D., 3:46094
See Gilligan, J.G., 3:45960
Prindle, A.L., *See* Meyer, R.A., 3:45730
See Nethaway, D.R., 3:45741
Privalov, V.E., Some directions of the technological processing of coals, 3:44023
Prokhoerov, A.M., *See* Goncharov, N.I., 3:45985
Prokhorov, V.G., *See* Pan, V.M., 3:45042, 3:45043
Prosperi, M., Shield design and streaming calculations for the sodium cooled PEC reactor, 3:44701
Prosser, F.W. Jr., *See* Tabor, S.L., 3:45714
Protasov, Y.S., *See* Kozlov, N.P., 3:45984
Prout, J.H., *See* Michael, P.L., 3:44100
Provenzano, G., Risk—benefit analysis and the economics of heavy metals control, 3:45357
Pruitt, R.G. Jr., Digest of mining claim laws, 3:44864
Pskovskii, Y.P., Light curves, color curves, and expansion velocity of type I supernovae as functions of the rate of brightness decline, 3:45446
Puehlhofer, F., *See* Christensen, P.R., 3:45745
Puigh, R.J., *See* Vandenbosch, R., 3:45734
Pummer, H., *See* Flicker, H., 3:45180
Pun, T.P., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Purcell, J.R., *See* Chen, W.Y., 3:45141
Purper, G., Use of solar energy equipment in developing countries as an example for a 'soft technology' and the possibilities for its promotion, 3:44343
Pyatov, N.I., *See* Baznat, M.I., 3:45694
Pytlinski, J.T., Use of solar energy for space heating in individual dwellings in Kansas, 3:44417 (CONF-761220—, pp 171-175)

Q

Quigg, C., Semiclassical sum rules, 3:45600
Quin, J.G., *See* Van Vleet, E.S., 3:45335
Quincy, E.A., Remote electromagnetic sensing of underground coal burns. Quarterly technical report, September—November 1977. Interim annual report, 3:44043 (FE—2414-6)
Quintenz, J.P., Nonuniform mesh diode simulation code, 3:45980

R

Rabitz, H., *See* Green, S., 3:45537
Racette, G.W., *See* Frost, R.T., 3:44359
Rack, H.J., *See* Myers, S.M., 3:45023
Rad, P.F., *See* Rhodes, D.A., 3:44635
Radebold, R., Liquid synfuel photosynthesis: intentions and examples, 3:44338
Raetz, K., Heat production and distribution in buildings with solar energy and heat pumps, 3:44931
Raevskaya, L.T., *See* Irkhin, Y.P., 3:45033
Raghavan, R., *See* Chang, C.M., 3:44465
Rahilly, W.P., Aluminum arsenide eutectic gallium arsenide solar cell, 3:44376
Rahm, D.C., *See* Cobb, J.H., 3:45559
Rahman, A., *See* Vashishta, P., 3:45094

Rai-Choudhury, P., *See* Page, D.J., 3:44629
Raikh, R.A., *See* Kermerov, A.I., 3:44113
Railio, J., Influence of tightening of the windows on the condensation and the heat economy, 3:44927 (UCRL-Trans—1548)
Possibilities of improving the heat insulation of the windows, 3:44936 (UCRL-Trans—1549)
Raimann, B., Solar energy system for greenhouses, 3:44454
Raines, G.L., *See* Offield, T.W., 3:44247
Raither, S., *See* Bebek, C.J., 3:45562
Rajagopalan, M., *See* Miller, J.M., 3:45751
Rajnak, K., Regularities in s-electron binding energies in l/sup N/s/sup M/ configurations, 3:45548
Rakhimov, A.T., *See* Andreeva, M.N., 3:46019
Ramachandran, R., *See* Balachandran, A.P., 3:45672
Raman, S., Observation of primary E2 transitions in the reaction $^{2}07Pb(n, y)$, 3:45754
Ramani, A., Heat flux reduction by electromagnetic instabilities, 3:46002
Ramaswamy, R., *See* Green, S., 3:45537
Ramsdell, J.V., Wind shear fluctuations downwind of large surface roughness elements, 3:44605
Ramsey, W.E., Cargo-Restraint-Transporter (CRT): a novel approach to the handling of cargo on DOE's Safe-Secure Trailers (SST), 3:44274 (Y/OA—2034)
Ramshaw, J.D., Existence of the dielectric constant in fluids of nonlinear rigid polar molecules, 3:45495
Rancurel, H., *See* Calamand, D., 3:44704
Rand McNally, J. Jr., D-^{3}He as a "clean" fusion reactor, 3:46104
Rankin, W.L., Attitudes of the public about nuclear wastes, 3:44296
Rantsev-Kartinov, V.A., *See* Aglitskii, E.V., 3:45916
Raphaelian, L.A., *See* Harrison, W., 3:45327
Rapidis, P., *See* Tanenbaum, W., 3:45602
Rapidis, P.A., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
Rapp, F. Jr., Solar collector unit, 3:44539
Rascher, R., *See* Hellmeister, H.P., 3:45726
Rasmussen, K.N., Economy of ventilators in plants with variable volume flow, 3:44949
Ratajczak, A.F., *See* Forestieri, A.F., 3:44381
Rau, R.N., Method and apparatus for investigating earth formations utilizing microwave electromagnetic energy, 3:45279
Rausch, E.O., *See* Thomas, E.W., 3:45058
Rawitscher, G.H., Effect of breakup on the spin dependence of the deuteron-nucleus interaction, 3:45728
Ray, E.D., Direct conversion of solar energy to mechanical energy, 3:44471
Ray, L., *See* Hoffman, G.W., 3:45702
Raychaudhuri, K., *See* Weisberg, H., 3:45582
Rayford Nix, J., *See* Amsden, A.A., 3:45762
Raymond, R.S., *See* Hennies, D., 3:45502
Razdobarin, G.T., *See* Burakov, V.S., 3:45917
Razhev, A.M., *See* Ishchenko, V.N., 3:45208
Razumovskaya, N.A., *See* Sokolova, R.S., 3:45202
Realini, G., *See* Nicks, R., 3:46093
Rebbi, C., *See* DeGrand, T., 3:45627
Rebibo, K., System for projecting the utilization of renewable resources. SPURR methodology, 3:44348 (ERHQ/2322—77/4)
Rebibo, K.K., Overview and market penetration methodology of a computer simulation model for projecting solar energy utilization, 3:44349
Reddy, G.N., Advanced processes for generation of electric power: solvent refining of coal and combined cycle plants, 3:44072 (CONF-7710101—11)
Redwine, R.P., *See* Burman, R.L., 3:45697
See Malbrough, D.J., 3:45708
See Preedom, B.M., 3:45689
Reed, A.W., *See* Pope, R.B., 3:45153
Reed, M.G., Hydrocarbon hydroconversion process employing hydroxy-aluminum stabilized catalysts supports, 3:44160
Reed, R.R., *See* Leon, I.W., 3:44614
Reeder, D.D., *See* Wanderer, P., 3:45570
Reents, H., Analysis of the final energy demand in individual demand sectors and projection of its future development, 3:44881
Reetts, T., Electrotransport in a ceramic based on thorium oxide, 3:45072
Regimbal, J.J., *See* Amos, J.C., 3:44691
Regnaud, F., *See* Lefort, G., 3:45151
Rehak, R., *See* Cobb, J.H., 3:45559
Rehm, K.E., $^{16}O + {}^{40}Ca$ inelastic scattering and direct-reaction calculations in heavy-ion scattering, 3:45725
See Meyer-Schuetzmeister, L., 3:45722
See Tabor, S.L., 3:45714
Reif, H.G., *See* Leonard, R.P., 3:45300, 3:45301, 3:45364, 3:45365
Reilly, J., *See* Wiswall, R., 3:45122
Reilly, J.T., Review of methods for the integration of reliability and design engineering, 3:44807 (GA-A—14748)
Reimann, K.J., *See* Longua, K.J., 3:44778
Reimer, G.M., Uranium exploration using helium detection: a case study, 3:44225 (USGS-CIRC—753, pp 52-53)
Reimers, R.S., Sorption phenomenon in the organics of bottom sediments, 3:45344
Reinhardt, P.W., *See* Compton, R.N., 3:45527
Reiter, E.R., Interannual variability of the ocean—atmosphere system, 3:45288
Reiter, U., *See* Bammert, K., 3:44396
Reivich, M., *See* Kuhl, D.E., 3:45388, 3:45392
Reizer, M.Y., *See* Geilikman, B.T., 3:45848
Renken, C.J., *See* Cox, C.W., 3:45268
Renner, T.R., *See* Schiffer, J.P., 3:45558
Rescigno, T.N., Calculation of the photoionization cross section of the $^{1}\Sigma$/sub u/$^{+}$ excimer state of Ar_2, 3:45496
Rester, A.C., *See* Sakai, M., 3:45743
Resvanis, L.K., *See* Cobb, J.H., 3:45559
Reudenauer, F., *See* Viehboeck, F.P., 3:44418
Rewerts, L.J., *See* Arnas, O.A., 3:44424
Reya, E., *See* Glueck, M., 3:45626
See Owens, J.F., 3:45593
Reynolds, J.H., *See* Meulenberg, A. Jr., 3:44375
Reynolds, R.L., Uranium associated with iron—titanium oxide minerals and their alteration products in a south Texas roll-type deposit, 3:44219 (USGS-CIRC—753, pp 37-38)
Reznikov, I.V., Optical properties of the entrance windows of photomultipliers, 3:45258
Rhodes, B.A., *See* Subramanian, G., 3:45391
Rhodes, C.K., *See* Flicker, H., 3:45180
See Kligler, D., 3:45173
Rhodes, D.A., Planning, design, and construction of nuclear power plants: an overview. Final report, 3:44635 (COO—4121-2)
Rice, F.H., Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling, 3:44475 (CONF-761220—, pp 13-14)
Richard, J.M., *See* Dover, C.B., 3:45632
Richard, P., *See* Jamison, K.A., 3:45532
Richardson, B.L., Removal diffusion theory for calculating the effectiveness of neutron and gamma-ray shields for nuclear reactors and chemical plants, 3:44766
Richardson, J.H., *See* Steinmetz, L.L., 3:45171
Richardson, M.C., CO_2 laser-plasma interaction studies at NRC-Canada, 3:45930
Richter, B., *See* Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Rickard, N.D., COCO: a computer program for seismic analysis of a single column of the HTGR core, 3:44805 (GA-A—14600)
Rickel, D.G., *See* Wender, S.A., 3:45706
Riddiford, C.L., New black chrome selective absorbing surface, 3:44483 (CONF-761220—, pp 93-96)
Ridgway, S.L., Evaluation of geothermal energy exploration and resource assessment. Final report. Volume II. Two phase flow in the geothermal wellbore, 3:44599 (SAN—1269-1(Vol.2))
Ridihalgh, J.L., *See* Anderson, R.T., 3:44275
Riedel, H., Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr—29)
Riedinger, L.L., *See* Guidry, M.W., 3:45748
Riley, J.P., *See* Olafsson, J., 3:44590
Riley, P.J., Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
Riley, R.E., *See* Browne, T.E., 3:44876
Riley, R.G., *See* Anderson, J.W., 3:45106
Ringland, G.A., *See* Halzen, F., 3:45638
Ripin, B.H., *See* Stamper, J.A., 3:45914
Rippey, J.O., *See* Wolfer, B.M., 3:44939
Riska, D.O., *See* Negele, J.W., 3:45691
Ritchie, L.T., *See* Sprung, J.L., 3:44811
Ritter, A., Chemical storage of energy, 3:44848
Rizzo, T., *See* Mathur, V.S., 3:45648
Roach, W.H., *See* Wescott, E.M., 3:45484
Roberson, N.R., *See* Weller, H.R., 3:45727
Roberts, H.L., *See* Wolfer, B.M., 3:44939
Roberts, J.T., *See* Skjoeldebrand, R., 3:44718
Roberts, K.V., *See* Christiansen, J.P., 3:46099
Roberts, R.G., *See* Halzen, F., 3:45638
Robertson, A.B., Electrical wire for use in nuclear generating stations, 3:44763
Robertson, H.S., Moderately concentrating solar collector, 3:44494 (CONF-761220—, pp 233-236)
Robertson, R.F.S., Utilization of waste heat from electricity generating stations, 3:44869 (AECL—5689)
Robertus, R.J., *See* Moore, R.H., 3:44031
Robinette, S.L., Optical study of the temperature dependent scattering of the a exciton (polariton) of naphthalene, 3:45000
Robinson, A.C., *See* Markarian, R.K., 3:44966
Robinson, C.W., *See* Pouliot, H.N., 3:44973
Robinson, E.L., *See* Guidry, M.W., 3:45748
Robinson, F.L., *See* Johnson, W.R., 3:44831
Robinson, G.F., *See* Hester, J.C., 3:44457
Robinson, J., *See* Parfitt, A.W., 3:44681
Robinson, J.W.J., *See* Spencer, D.L., 3:44478
Robinson, W.R., *See* Bhattacharyya, S.K., 3:44786
Rock, S., *See* Arnold, R.G., 3:45687

Rodabaugh, E.C., End effects on elbows subjected to moment loadings, 3:44760 (ORNL/Sub—2913/7)
Roe, B.P., *See* Bell, J., 3:45567
Roess, D., Optical emitter or amplifier for energy-rich radiation (Laser), 3:45211
Rogers, J.W., *See* Harker, Y.D., 3:44785
Rogers, V.C., *See* Macbeth, P.J., 3:45314
Roinishvili, V.N., *See* Antipov, Y.M., 3:45586
Rolfe, G.L., Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
Rollin, D.F., *See* Corkum, P.B., 3:45214
Romanini, E., *See* Bernardi, A., 3:44580
Romanov, Y.A., Nonlinear transmission and reflection of electromagnetic waves obliquely incident on a plasma slab. II. Waves of different polarization, 3:46064
Nonlinear transmission and reflection of electromagnetic waves of identical polarization which are incident obliquely on a plasma slab, 3:46071
Ronan, M.T., *See* Jaros, J.A., 3:45561
Ronningen, R.M., *See* Todd Baker, F., 3:45755
Root, E.F., Highly efficient solar collector including means for preventing cover plate fluid condensation, 3:44550
Self-jigging method of fabricating solar collector heat trap from flexible plastic roll material, 3:44533
Rosen, S.P., Is the tau a paraelectron, 3:45621
Rosenbaum, F.J., *See* Becker, E.W., 3:44257
Rosenberg, R., *See* Cuomo, J.J., 3:44382
Rosenbluth, M.N., *See* Chernin, D.P., 3:45889
Rosenfeld, A.H., *See* Longacre, R.S., 3:45634
Rosenfeld, L., *See* Chadwick, G.B., 3:45585
Rosholt, J.N., *See* Dooley, J.R. Jr., 3:44249
Rosinskii, S.E., Injection of a relativistic electron beam into a bounded plasma in a magnetic field, 3:45968
Theory of electromagnetic instabilities in an inhomogeneous plasma stream with an anisotropic pressure, 3:46023
See Grishin, V.K., 3:45969
Rosner, J.L., *See* Quigg, C., 3:45600
Ross, D.W., *See* Hazeltine, R.D., 3:45997
Ross, R.R., *See* Alston-Garnjost, M., 3:45583, 3:45584
See Jaros, J.A., 3:45561
Ross, R.T., *See* Bell, J., 3:45567
Rost, E., Distorted-wave Born-approximation description of the ^{4}He(p,d)^{3}He reaction at E/sub p/ = 770 MeV, 3:45684
Rostomyan, E.V., *See* Rosinskii, S.E., 3:45968
Roters, K., Storage of solar energy. Necessity and some principles, 3:44565
Roth, D.R., *See* Bockhold, G. Jr., 3:44773
Roth, J.R., Alternative approaches to plasma confinement, 3:46083 (N—77-34000)
Rothenberg, H., *See* Kuhl, D.E., 3:45388
Rothrock, R.B., *See* Ombrellaro, P.A., 3:44780
Rounds, J., *See* Black, S., 3:44097
Rowley, J.K., *See* Bahcall, J.N., 3:45453
Rozhavskii, A.S., *See* Mitsai, Y.N., 3:45840
Rozov, A.I., *See* Kolesnikov, E.K., 3:45972
Rozsa, R.B., *See* Aiman, W.R., 3:44056
Rubbia, C., *See* Wanderer, P., 3:45570
Rubinov, A.N., *See* Batishche, S.A., 3:45193
Rudakov, V.P., *See* Artemov, K.P., 3:45713
Ruderman, M.S., Effect of refraction on the propagation of magnetosonic waves in an inhomogeneous plasma, 3:46061
Rudolph, M., *See* Schaefer, H., 3:44917
Rudy, C.E., *See* Sullivan, R.F., 3:44065
Rukhadze, A.A., *See* Grishin, V.K., 3:45969
Rukhlin, V.G., *See* Grishin, V.K., 3:45969
See Rosinskii, S.E., 3:45968, 3:46023
Rule, A.O., Fireplace closure and safety device, 3:44941
Rumyantsev, V.S., *See* Amaglobeli, N.S., 3:45587
Rupasov, A.A., *See* Bychenkov, V.Y., 3:45918
Rupert, V.C., *See* Storm, E.K., 3:46118
Rupp, M.W., Comparative performance of several flat plate designs, 3:44477 (CONF-761220—, pp 59-61)
Rush, C.K., *See* Oosthuizen, P.H., 3:44897
Russell, J.L., *See* Eggers, G.H., 3:44488
Russo, A.J., *See* Sprung, J.L., 3:44811
Russo, G., *See* Demichelis, F., 3:44552
Rustanovich, D.N., *See* Andreev, S.S., 3:45430
Ruth, T.J., *See* Cumming, J.B., 3:45733
Ruye, J.D., *See* Olink, H., 3:44537
Ryabov, Y.G., *See* Baranov, D.S., 3:45571
Ryan, P.M., *See* Whealton, J.H., 3:46103
Ryskin, M.G., *See* Dokshitser, Y.L., 3:45643

S

Saakyan, G.S., *See* Grigoryan, L.S., 3:45761
Sabin, C.M., Reply to comments on seawater side enhancement for OTEC heat exchangers, 3:44400 (CONF-770331—, pp VI.110)
Sabitova, T.M., Periods of surface waves, 3:45407 (UCRL-Trans—11366)
Sachse, K., Manufacturing of a double-wall reactor insert by using special equipment for monitoring the strains and stresses caused by welding, 3:44764
Sadoulet, B., *See* Tanenbaum, W., 3:45602
Sagle, A.L., *See* Nasser, M.A., 3:45573
Saiy, M., Simultaneous generation of heat and electricity, 3:44394 (CONF-761220—, pp 395)
Saknev, R.I., *See* Batishche, S.A., 3:45193
Sakai, K., Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma, 3:45947 (N—77-33986)
Sakai, M., Quasi-ground, quasi-beta, and quasi-gamma bands, 3:45743
Sakamoto, Y., Experimental study of excitation of low frequency plasma waves by amplitude-modulated microwave, 3:46076
Sakata, S., *See* Oka, Y., 3:44707
Sakharov, A.S., *See* Bulanov, S.V., 3:46078
Sakharov, N.V., *See* Zhilinskii, A.P., 3:45920
Sakharov, V.K., *See* Abagjan, A.A., 3:44769
Sakhuja, R.K., Performance of Rankine Cooling System with intermediate temperature solar collectors, 3:44496 (CONF-761220—, pp 253-258)
Salamov, D.I., *See* Baznat, M.I., 3:45694
Salomaa, R., Observable manifestations of phase transitions in lasers, 3:45187
Saltmarsh, M.J., *See* Preedom, B.M., 3:45689
Salukvadze, R.G., *See* Amaglobeli, N.S., 3:45587
Salvatores, M., *See* Estiot, J.C., 3:44705
Samoilov, I.M., *See* Ogorodnikov, D.D., 3:45557
Samoilov, V.M., Radiationless mixing in kaonic atoms, 3:45520
Samokhvalov, A.A., *See* Tatsenko, O.M., 3:45071
Sampson, D.H., Intermediate-coupling collision strengths for fine-structure transitions between S and P levels and S and D levels in highly charged He-like ions, 3:45531
Samson, J.C., *See* Corkum, P.B., 3:45214
San Martin, R.L., *See* Diamond, S., 3:44422
Sanda, A.I., *See* Marciano, W.J., 3:45614
Sanders, B.R., *See* Dwyer, H.A., 3:45130
Sanders, H.L., Florida oil spill impact on the Buzzards Bay benthic fauna: West Falmouth, 3:44181
Sanders, J.P., *See* Ball, S.J., 3:44809
Sanders, S.J., *See* Paul, M., 3:45716
Sanderson, J.J., *See* Gary, S.P., 3:45999
Sandor, L., *See* Amaglobeli, N.S., 3:45587
See Budagov, Y.A., 3:45590
Sandorfi, A.M., *See* Nathan, A.M., 3:45701
Sandstrom, W.R., Portable solar energy collector, 3:44501
SanFilippo, G.P., Oil recovery by carbon dioxide injection. Quarterly report, October—December 1976, 3:44151 (ORO—5301-7)
Sanin, V.M., *See* Miroshnichenko, I.I., 3:45607
Santala, T.J., Solar absorption surface panel, 3:44526
Sanuki, H., Microinstabilities in a plasma slab with steep density gradient, 3:45991 (N—77-34002)
Nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma, 3:46033 (IPPJ—268)
Parametric decay of lower hybrid wave into drift waves, 3:46038 (N—77-33988)
Sapelkin, N.V., Laser cavity with low-reflectance output mirror and reduced radiation loading on the element, 3:45199
Sarabun, C.C. Jr., Field investigations of convergences and slick concentration mechanisms in Delaware Bay. (Research on the effects of crude oil transfer and upstream refineries on Delaware Bay), 3:45332 (PB—275692)
Sargent, C.P., *See* Lichtenstadt, J., 3:45758
Sartory, W.K., *See* Corum, J.M., 3:45013
Saslow, W.M., *See* Lumpkin, M.E., 3:45556
Sato, K.N., High-temperature high-quality deuterium plasma production by laser beams and interactions with magnetic fields, 3:46122
Sato, M., *See* Sugai, H., 3:46053
Satow, H., Rotary piston engine exhaust gas recycling means, 3:44980
Satow, T., *See* Fujino, H., 3:45140
Satya, Y., Scattering of drift waves by parametric interaction, 3:46042
Sauer, K., Nonlinear reflection of an intense electromagnetic wave from a dense plasma slab, 3:46065
Saunders, K.D., *See* Harrison, W., 3:45327
Saunders, N.B., Solar collector and heating and cooling system, 3:44442
Savin, W., *See* Todd Baker, F., 3:45755
Savit, R., *See* Einhorn, M.B., 3:45662
Savitskii, G.A., *See* Nemashkalo, A.A., 3:45735
Savushkin, L.N., One-boson exchange potentials and their use in low energy nuclear physics, 3:45791
Sawa, T., *See* Otani, K., 3:44626
Sawada, Y., *See* Shiobara, K., 3:45054
Sawatzky, D.L., *See* Offield, T.W., 3:44247
Sawochka, S.G., Effects of hydrogen peroxide additions on shutdown chemistry transients at pressurized water reactors. Final report, 3:44647 (EPRI-NP—692)
Sawyer, C.D., *See* Fletcher, J.C., 3:44774
Sawyer, J.W. Jr, *See* Harrington, W., 3:44090
Sawyer, R.F., *See* Pitz, W.J., 3:45129

Sawyer, R.J. Jr., *See* Pietrafesa, L.J., 3:45436
Saxena, S.C., Modeling of a fluidized bed combustor with immersed tubes. Quarterly report, March—August 1977, 3:45231 (FE—1787-8)
Sayer, R.O., Recoil-distance measurement of lifetimes of rotational states in ^{164}Dy, 3:45750
Sayigh, A.A.M., Investigation into solar heaters with some methods for convection suppression, 3:44476 (CONF-761220—, pp 51-58)
Some experimental data for thermal pile energy storage, 3:44560 (CONF-761220—, pp 27-34)
Summer night cooling in Saudia Arabia, 3:44425 (CONF-761220—, pp 271-281)
Scaiano, J.C., *See* Small, R.D. Jr., 3:45124
Scalise, S.J., *See* Barnes, N.P., 3:45179
Schaefer, H., Impact of the technological change on energy technology, 3:44606 (AED-Conf—76-399-002)
Suggestion for the definition and term limitation in the environment and waste heat utilisation, 3:44917
Schaefer, R.W., *See* Bhattacharyya, S.K., 3:44786
Schafer, C.J., Current regulations and enforcement experience by the environmental protection agency, 3:45356
Schalk, T., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Schankula, M.H., Performance of highly rated UO_2 fuel in the WR-1 organic-cooled reactor, 3:44777 (AECL—5399)
Scharff-Goldhaber, G., *See* Chu, Y.Y., 3:45768
See Goldhaber, A.S., 3:45781
Scharfman, H., Vented solar collector, 3:44551
Scharre, D.L., Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581
See Jaros, J.A., 3:45561
Schatz, J.F., *See* Swift, R.P., 3:45076
Schechter, D.E., *See* Whealton, J.H., 3:46103
Schiffer, J.P., Search for +1/3e fractional charges in Nb, W, and Fe metal, 3:45558
See Henning, W., 3:45740
See Paul, M., 3:45716
Schiffers, A., Large wet-type cooling towers and their influence on the environment, 3:44612
Schindler, R.H., *See* Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Schivell, J., *See* Suckewer, S., 3:45935
Schlatter, J.C., *See* Klimisch, R.L., 3:44992
Schlesinger, J., Card controlled beta backscatter thickness measuring instrument, 3:45264
Schlieban, E.W., *See* Michaelis, T.D., 3:44838
Schmid, E., *See* Becker, E.W., 3:44257
Schmider, J., *See* Artemov, K.P., 3:45713
Schmidt, E., *See* Hellmeister, H.P., 3:45726
Schmidt, G., *See* Satya, Y., 3:46042
Schmidt, H., Responsibility of research for the future of society, 3:44868
See Rasmussen, K.N., 3:44949
Schmitt, R.P., *See* Wozniak, G.J., 3:45760
Schmitt, W., KWU proposal for the national practice in the assessment of integrity against fracture for nuclear components, 3:44755 (IAEA—18; CONF-751268—, pp 11-21)
Schmorak, M.R., Nuclear data sheets for A=203, 3:45757
Schneider, A., Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976—April 1977 and quarterly technical progress report No. 4, February 1977—April 1977, 3:44064 (FE—2306-12)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7—July 31, 1976, 3:44069 (TID—28163)
Schneider, J., Calculation of the influence of a thermal shield on the neutron flux and on the tritium production in a fusion reactor blanket, 3:46090 (HMI-B—235)
Schneider, S.J., Materials research for clean utilization of coal. Quarterly progress report, July—September 1977, 3:44049 (FE—3800-13)
Schoell, M., Natural gases in the south German Molasse Basin. Application of D/H and $^{13}C/^{12}C$ isotope analyses to deduce their origin, 3:44194
Schoenbach, K., *See* Herziger, G., 3:45936
Schoenmackers, R., *See* Britt, H.C., 3:45776
Scholz, H., Method of producing coatings having a high absorption in the range of the solar spectrum, 3:44507
Schriber, S.O., Future of high intensity accelerators in nuclear energy, 3:45246 (AECL—5903)
Schriefer, A.H. Jr., Solar panel, 3:44522
Schriewer, M., *See* Maier, K., 3:44997
Schroeder, H.W., High-power single-mode cw dye ring laser, 3:45189
Schroeder, J., Selection criteria and properties of materials for latent storage of thermal energy, 3:44843
Schuetz, W.P., *See* Arnold, R.G., 3:45687
Schulten, R., Decisions of the way to the future energy supply - a fatal question for society, 3:44720
Importance of the high-temperature reactor for the future energy market, 3:44659
Thermochemical process for producing methane and oxygen, 3:44331
Schulz, H., Solar technology in agriculture, 3:44459
Schumacher, P.E., *See* Levin, B.P., 3:44925
Schuttelkopf, H., *See* Berg, R., 3:44303
Schwartz, S.E., *See* Hercher, M., 3:45181
Schwartzman, E.H., Energy conversion system, 3:44609
Schwarz, H.J., Laser interaction and related plasma phenomena. Volume 4a, 3:46119
Schwarzenegger, K., *See* Ikezi, H., 3:46034
Schweizer, T.C., *See* Doering, R., 3:45715
Schwerzel, R.E., Evaluation of the commercial feasibility of hydrogen production by the solar photoelectrolysis of water. Task I interim report, 3:44390 (TID—27802)
Schwirzke, F., Laser-induced desorption of impurities from the macrotor tokamak walls, 3:45885
Schwitters, R.F., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Sciulli, F., *See* Barish, B.C., 3:45566
Sciulli, F.J., *See* Merritt, F.S., 3:45569
Scott, A., *See* Todd Baker, F., 3:45755
Scott, D.M., *See* Halzen, F., 3:45669
Scott, J., *See* Daniels, J., 3:44244
Scott, P.B., *See* Sze, R.C., 3:45178
Scott, R.D., *See* Michaelis, T.D., 3:44838
Scott, T.L., *See* Brown, B.S., 3:45057
Scott, W.G., *See* Bell, J., 3:45567
Scudiere, M.B., *See* Ward, J.T. Jr., 3:45814
Seaborg, G.T., *See* Otto, R.J., 3:45759
Seager, C.H., Zero-bias resistance of grain boundaries in neutron-transmutation-doped polycrystalline silicon, 3:45101
Searl, M., Energy supplies: a look ahead, 3:44877
Searl, M.F., *See* Browne, T.E., 3:44876
Searls, J., *See* Browne, T.E., 3:44876
Sedlacek, Z., Computation of two-stream explosive instability including harmonics generation and distribution function evolution, 3:46007
Sedlmayr, M., Energy cost reduction by latent heat buffers, 3:44844
Seeger, R., *See* Binkley, J.S., 3:45544
Segel, R.E., *See* Zeidman, B., 3:45700
Seiden, A., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Seidl, A.A., *See* Bell, J., 3:45567
Seiler, W., *See* Radebold, R., 3:44338
Sekiguchi, T., *See* Ohwadano, Y., 3:46113
See Sato, K.N., 3:46122
Selcuk, M.K., Vacuum tube vee-trough collector for solar heating and air conditioning applications, 3:44487 (CONF-761220—, pp 201-205)
Selig, W., Titrimetry is alive and well at LLL, 3:45110 (UCRL—80878)
Sellin, I.A., *See* Vane, C.R., 3:45534
Semenenko, E.E., *See* Lazarev, B.G., 3:45045
Semenov, I.B., *See* Ivanov, N.V., 3:46070
Semenov, V.V., *See* Burakov, V.S., 3:45917
Semerdzhiev, K.I., *See* Angelov, N., 3:45589
Seminozhenko, V.P., *See* Kirichenko, I.K., 3:45842
Semper, R., *See* Perez-Mendez, V., 3:45254
Sen, A., Three-dimensional effects in the non-linear propagation of lower-hybrid waves, 3:46048
Senftle, F.E., *See* Tanner, A.B., 3:44227
Sengoku, S., *See* Yamamoto, S., 3:45938
Senitzky, I.R., Macroscopic description of laser-type matter. Final technical report (3rd year), August 1976—August 1977, 3:45851 (AD-A—048442)
Sens, J.C., *See* Fisk, R.J., 3:45575
Seraphin, B.O., *See* Donnadieu, A., 3:44374
Sercely, R.R., $^{14}C(t,p)^{16}C$ reaction at 23 MeV, 3:45692
Sercemitsos, P.J., *See* Mushotzky, R.F., 3:45451
Serduke, F.J.D., *See* Monahan, J.E., 3:45782
Serdyuk, O.V., Effect of a weak field asymmetry on stability in an adiabatic magnetic confinement system, 3:45275
Serebryakov, V.A., *See* Sokolova, R.S., 3:45202
Sereni, J.G., Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys, 3:45028
Serikov, I.N., *See* Artemov, K.P., 3:45713
Seshan, K., Role of stresses in annealing of ion-implantation damage in Si, 3:45100
Seth, K.K., *See* Hoffman, G.W., 3:45702
Sethian, J.D., Cornell Thomson scattering system, 3:45913
Setser, D.W., *See* Tellinghuisen, P.C., 3:45176
Severnyi, V.V., *See* Babaritskii, A.I., 3:45983
Sextro, R.G., *See* Westfall, G.D., 3:45707
Sgro, A.G., Calculations of the effects of incomplete preionization in high voltage theta pinches, 3:45879
Sh'pinel', V.S., *See* Bogdanov, P.V., 3:45051
Shaalan, M.R., *See* Sayigh, A.A.M., 3:44560
Shafranov, T.V., *See* Parail, V.V., 3:46075
Shafroth, S.M., *See* Tanis, J.A., 3:45529
Shah, Y.M., Inspection manual for the enforcement of new source performance standards: coal preparation plants. Final report, 3:44124 (PB—274262)
Shaikh, N., *See* Anderson, F.R., 3:44099
Shakhnazaryan, Y.G., *See* Khachatryan, G.N., 3:45609

Shalatskii, S.V., *See* Miroshnichenko, I.I., 3:45607
Shalimoff, G.V., $3d^2$—3d4f transitions in V IV, 3:45499
Shallenberger, J.M., Handling apparatus for a nuclear reactor fuel assembly, 3:44762
Shallo, F.A., *See* Anderson, R.T., 3:44275
Shampine, L.F., Storage reduction for Runge-Kutta codes, 3:46140 (SAND—78-0909)
Shaner, J.W., *See* Mao, H.K., 3:45270
Shanks, H.R., *See* Dietz, R.E., 3:45103
Shapiro, A.I., *See* Shimanskii, V.K., 3:45435
Shapiro, E., *See* Dradesky, E.L., 3:44624
Shapiro, I.S., *See* Kerbikov, B.O., 3:45856
Shapiro, M.A., Investigations of heavy metals and other persistent chemicals, Westernport Bay, Australia, 3:45349
Shapkin, V.V., *See* Babaritskii, A.I., 3:45983
Sharan, P., *See* Balachandran, A.P., 3:45672
Sharapov, E.I., *See* Alfimenkov, V.P., 3:45690
Share, G.H., Pulse-shape discrimination of high-energy neutrons and gamma rays in NaI(Tl), 3:45256
Sharimanov, Y.G., *See* Naskidashvili, I.A., 3:45064
Sharkov, B.Y., *See* Bykovskii, Y.A., 3:45988
Sharma, R.K., Perspectives on fish impingement, 3:44622 (CONF-771231—3)
Sharp, R.R. Jr., Uranium hydrogeochemical and stream sediment reconnaissance data release for the New Mexico portions of the Douglas, Silver City, Clifton, and Saint Johns NTMS quadrangles, New Mexico/Arizona, 3:44215 (LA—7180-MS)
Shaw, H., *See* Diamond, S., 3:44422
Shaw, M.J., Measurements of some reaction rates of importance in KrF lasers, 3:45188
Shaw, R.A., EPRI programs in power reactor radiation control, 3:44638
Shcheglov, D.A., *See* Aglitskii, E.V., 3:45916
Shcheglova, L.M., *See* Angelov, N., 3:45589
Shchelev, M.Y., *See* Kas'yanov, Y.S., 3:45915
Shcherbinin, P.P., *See* Volkov, A.D., 3:44906
Sheen, S.H., Collision-induced ion-pair formation of CsCl and Cs_2Cl_2, 3:45526
Sheffield, J., *See* Hugill, J., 3:45891
Shelankov, A.L., Electric field in gapless superconductors, 3:45847
Shelby, J.E., Effect of morphology on helium mobility in soda-lime-silica glasses, 3:45095
Sheldrake, C.W., *See* Singleton, A.H., 3:45236
Sheline, R.K., *See* Struble, G.L., 3:45747
See Yamazaki, Y., 3:45753
Shelton, J.W., *See* Al-Shaieb, 3:44229
Shen, C.N., *See* Bessler, W., 3:44430
Shen, Y.R., *See* Yu, P.Y., 3:45092
Shepard, J.R., *See* Rost, E., 3:45684
Shera, E.B., *See* Yamazaki, Y., 3:45753
Sherif, M.A., *See* Volkova, L.M., 3:45925
Sherman, D.E., *See* Byerly, R.T., 3:44628
Sherman, F., Chromosomal translocation causing overproduction of iso-2-cytochrome c in yeast, 3:45373
Sherman, R., Raman studies of hydrogen vibrational modes in palladium, 3:45118 (COO—1198-1212)
Sherman, V.E., *See* Fadin, V.S., 3:45676
Sheroziya, G.A., *See* Bykovskii, Y.A., 3:45988
Shevchenko, A.D., *See* Pan, V.M., 3:45042, 3:45043
Shevchenko, N.G., *See* Polishchuk, V.N., 3:45736
Shevchenko, S.I., Possible new superfluidity mechanism for a He^3 film on a metal surface, 3:45552
Shevel'ko, A.P., *See* Kas'yanov, Y.S., 3:45915
Shewchun, J., *See* Singh, R., 3:44364
Shields, V.E., *See* Wolfer, B.M., 3:44939
Shifman, M.A., *See* Vainshtein, A.I., 3:45673
Shih, L.L., Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{122}Ag, 3:45739
Shikanov, A.S., *See* Bychenkov, V.Y., 3:45918
Shikazono, N., Rock-water solution systems in geothermal fields, 3:44601 (CONF-7610123—4)
Shilov, V.M., *See* Afanas'ev, G.N., 3:45802
Shimanskii, V.K., Individual components of low-boiling (up to 125°C) hydrocarbons in organic matter of sedimentary rocks, 3:45435
Shimomura, Y., *See* Yamamoto, S., 3:45938
Shindo, Y., *See* Fujino, H., 3:45140
Shiobara, K., Potentiostatic study on anodic behavior of iron—chromium alloys, 3:45054 (ORNL-tr—4622)
Shirkov, G.D., *See* Ivanov, M.Y., 3:45807
Shirotani, T., Status of plutonium assessment in lung, 3:45403 (ORNL-tr—4619)
Shishko, A.A., *See* Koshilev, N.A., 3:45896, 3:45942
Shitikova, K.V., *See* Smirnov, Y.F., 3:45811
Shklovskaya, A.I., *See* Angelov, N., 3:45588, 3:45589
Shkol'nik, S.M., *See* Baksht, F.G., 3:45926, 3:45927
Shlyapnikov, P.V., *See* Likhoded, A.K., 3:45635
Shmariovich, E.M., Mechanism of layer-infiltration ore deposition, 3:44211
Shmatikov , M.Z., *See* Grach, I.L., 3:45677
Shoemaker, R.H., Technical criteria and bases: pressurized water-cooled, graphite moderated production reactor, 3:44791 (HW—53612(Rev.2))
Sholtis, J.A., *See* Holtzscheiter, E.W., 3:44324
Shope, S., Self-magnetic insulation in vacuum for coaxial geometry, 3:45248
Shore, B., *See* Shore, V.G., 3:45368
Shore, B.W., Coherence vs. incoherence in stepwise laser excitation, 3:45862
Effects of magnetic sublevel degeneracy on Rabi oscillations, 3:45547
See Rajnak, K., 3:45548
Shore, V.G., Isolation and characterization of two threonine-poor apolipoproteins of human plasma high density lipoproteins, 3:45368
Shorina, L.M., *See* Volkov, A.D., 3:44906
Short, R.T., *See* McNicol, B.D., 3:44914
Shoshiashvili, S.S., *See* Amaglobeli, N.S., 3:45587
Shotov, A.P., *See* Girich, B.G., 3:45186
Shou, J.K., *See* Stewart, O.W., 3:44126
Shpak, M.T., *See* Danileiko, M.V., 3:45196
Shrock, R.E., *See* Albright, C.H., 3:45620
See Lee, B.W., 3:45601
Shtan', A.F., *See* Voitsenya, V.S., 3:45939
Shubalov, S.M., *See* Bykovskii, Y.A., 3:45988
Shubin, A.P., Cathode potential drop in the channel of a magnetoplasma compressor, 3:45975
Dynamics of a multicomponent plasma in a quasisteady coaxial accelerator with an azimuthal magnetic field, 3:45974
Shukla, P.K., *See* Spatschek, K.H., 3:46050
Shul'ga, S.Z., *See* Galushka, A.P., 3:45105
Shumaker, J.L., *See* Bollinger, J.C., 3:45322
Shunin, G.E., *See* Miloshenko, V.E., 3:45841
Shutt, E., *See* Acres, G.J.K., 3:44985
Shwe, H., *See* Heckman, H.H., 3:45688
Sick, I., *See* Arnold, R.G., 3:45687
Sidhu, D.P., *See* Mohapatra, R.N., 3:45649, 3:45650
Sidhu, G.S., Transport of neutron and secondary gamma radiations through a liquid air sphere surrounding a 14-MeV neutron source, 3:45826
Sidorak, L.G., *See* Forestieri, A.F., 3:44381
Sidorinn, V.M., *See* Goncharov, N.I., 3:45985
Sidorov, V.A., *See* Kravtsov, N.V., 3:45206
Sidorova, I.K., *See* Khorasanov, L.G., 3:46057
Siegrist, J., *See* Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Siemon, R.E., Summary of Syllac results, 3:46082 (LA—7125-MS)
Siemssen, R.H., *See* Zeidman, B., 3:45700
Sierk, A.J., *See* Negele, J.W., 3:45765
Sikivie, P., Screening solutions to classical yang-mills theory, 3:45660
Sil'nov, S.M., *See* Bykovskii, Y.A., 3:45988
Silin, V.P., *See* Andreev, N.E., 3:46025
See Bychenkov, V.Y., 3:45918, 3:46017
Sills, H., *See* Campbell, F.R., 3:44770
Silver, R.N., Hydrodynamic approach to electron-hole droplet nucleation and stability, 3:45835
Silverman, A., *See* Bebek, C.J., 3:45562
Simmons, H.M., *See* Root, E.F., 3:44550
Simmons, J.E., *See* Riley, P.J., 3:45704
Simms, R.J., *See* Henderson, T.M., 3:44318
Simonov, Y.A., *See* Kudryavtsev, A.E., 3:45857
Simons, A.L., *See* Ikezi, H., 3:46034
Simplaceanu, V., *See* Naskidashvili, I.A., 3:45064
Simpson, H.D., Thermodynamic interaction between transition metals and simulated auto exhaust, 3:44984
Simpson, R.J., *See* Riddiford, C.L., 3:44483
Sims, C.T., High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1—December 30, 1977, 3:44615 (FE—1765-42)
Singer, S., CO_2 laser systems for fusion experiments, 3:46121
Singh, J.J., Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N—77-34018)
Singh, M., *See* Dabrowski, A.J., 3:45255
Singh, R., Possible explanation for the photovoltaic effect in indium tin oxide on InP solar cells, 3:44364
Singhal, N.C., *See* Sayer, R.O., 3:45750
Singleton, A.H., Method for removing hydrogen sulfide from sulfur-bearing industrial gases with clause-type reactors, 3:45236
Sinha, A.N., Analysis of fuel conservation through aircraft towing. Technical report, 3:44951 (PB—274586)
Sinha, M., Effect of an electron beam on pump-driven quasi-modes, 3:46049
Sinman, A., Experiments with a relativistic electron beam injected into a plasma, 3:45900
Sirota, N.N., Temperature dependence of the anisotropy of thermal expansion of scandium, 3:45039
Siskind, E., *See* Barish, B.C., 3:45566
Sisson, R.D. Jr., *See* Biederman, R.R., 3:44801
Sisterson, L.K., *See* Bebek, C.J., 3:45562
Sitenko, Y.A., *See* Miranskii, V.A., 3:45675
Sivers, D., *See* Babcock, J., 3:45629
Sjoblom, R.K., *See* Ahmad, I., 3:45767
Skjoeldebrand, R., IAEA nuclear power forecast for developing countries,

3:44718 (CONF-760688—, pp 100-111)
Sklizkov, G.V., *See* Basov, N.G., 3:46124
See Bychenkov, V.Y., 3:45918
Sklyarov, V.P., *See* Egorov, Yu.A., 3:44827
Skobelev, I.Y., *See* Vinogradov, A.V., 3:45928
Skorokhvatov, M.D., *See* Mikaelyan, L.A., 3:45786
Skrivankova, M., Nondestructive determination of nuclear fuel enrichment by Ge(Li) spectrometer, 3:44263
Slater, C.E., *See* Davis, P.R., 3:44803
Slater, D.C., *See* Cover, R.A., 3:45906
Slater, J.B., Overview of the potential of the CANDU reactor as a thermal breeder, 3:44663 (AECL—5679)
Slaughter, G.G., *See* Raman, S., 3:45754
Slepets, T.F., *See* Eremin, I.V., 3:44080
Sliney, J.L., *See* Godrick, J.A., 3:44524
Slinn, W.G.N., Relationships between removal processes and residence times for atmospheric pollutants, 3:45290 (CONF-780611—3)
Sly, K.N., *See* Milgram, M.S., 3:44675
Smaardyk, J.E., High resolution ac calorimeter for organic liquids, 3:45252
Smadja, G., *See* Longacre, R.S., 3:45634
Small, G.J., *See* Robinette, S.L., 3:45000
Small, R.D. Jr., Direct detection of the biradicals generated in the Norrish type II reaction, 3:45124
Smart, W., *See* Bell, J., 3:45567
Smereka, T.P., *See* Gupalo, M.S., 3:45036
Smirnov, A.S., *See* Zhilinskii, A.P., 3:45920
Smirnov, V.B., *See* Bagaev, S.A., 3:45515
Smirnov, V.S., Some ways of improving the energy characteristics of lamp-pumped dye-solution lasers, 3:45192
Smirnov, Y.F., Method of K harmonics and the shell model, 3:45811
Smirnov, Y.G., *See* Batkin, I.S., 3:45519
Smirnov, Y.I., *See* Baranov, D.S., 3:45571
Smith, B.D., *See* O'Connor, L.J., 3:44242
Smith, D.R., Analysis of alternative transportation methods for radioactive materials shipments including the use of special trains for spent fuel and wastes, 3:44272 (CONF-780506—9)
See Thomas, J.T., 3:44273
Smith, D.W., Steel industry wastes, 3:44965
Smith, G.E., Solar radiation data base development based on bright sunshine data, 3:44346 (CONF-761220—, pp 339)
Smith, J., Electromagnetic backgrounds in neutrino-produced trimuon events, 3:45599
See Albright, C.H., 3:45620
Smith, J.C., *See* Clarkson, T.W., 3:45423
Smith, J.E., *See* Corum, J.M., 3:45013
Smith, J.F., *See* Eshelman, F.R., 3:45024
Smith, M.F., Coal mine waste (a bibliography with abstracts). Report for 1964—January 1978, 3:44086 (NTIS/PS—78/0052)
Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964—1977, 3:44253 (NTIS/PS—78/0048)
Uranium mining and milling environmental studies (citations from the Engineering Index data base). Report for 1970—1977, 3:44254 (NTIS/PS—78/0049)
Smith, P.J., One hundred days at Windscale, 3:44267
Smith, R.D., *See* Campbell, J.A., 3:45304
Smith, S.L., Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL—24177)
Smolenski, J.V., *See* Hale, G.L., 3:44037
Smoot, L.D., Mixing and gasification of coal in entrained flow systems. Quarterly technical progress report No. 2, July 1—September 30, 1977, 3:44047 (FE—2666-2)
Snapp, P.C., Phipps Bend Nuclear Energy Project. Community impact assessment. Final report, 3:44645 (PB—274370)
Snell, V.G., Safety of CANDU reactors, 3:44794 (AECL—5800, pp 11-17)
Snyder, H.D., *See* Fisk, R.J., 3:45575
Sobol', I.M., *See* Pozdnyakov, L.A., 3:45437
Sobolev, O.P., *See* Breizman, B.N., 3:46077
Sodd, V.J., *See* Subramanian, G., 3:45391
Soete, W., Fracture mechanics and welding, 3:44756 (IAEA—18; CONF-751268—, pp 103-117)
Sokoloski, M.M., Radiation hardened field effect device, 3:45267
Sokolov, A.A., *See* Baranov, D.S., 3:45571
See Volkov, G.G., 3:45623
Sokolov, B.A., Geological conditions of petroleum formation and accumulations on ancient platforms, 3:44148
Sokolov, V.A., Nonlinear Zeeman effect in a ring gas laser, 3:45201
See Golyaev, Y.D., 3:45195
Sokolova, L.V., *See* Burakov, V.S., 3:45917
Sokolova, R.S., Durable interference polarizers for lasers, 3:45202
Sokolovskaya, I.B., *See* Nefedov, Yu.A., 3:44084
Solari, P.A., *See* Dutton, L.M.C., 3:44684
Solbrig, C.W., *See* Lyczkowski, R.W., 3:44820
Solem, J.C., *See* Veeser, L.R., 3:45981
Sollatov, V.P., *See* Startsev, V.I., 3:45019
Solntsev, A.M., *See* Ogorodnikov, D.D., 3:45557
Solodov, A.M., *See* Makogon, M.M., 3:45205
Solodovchenko, S.I., *See* Voitsenya, V.S., 3:45939
Solomin, A.N., *See* Angelov, N., 3:45589
Solomon, D.E., *See* Henderson, T.M., 3:44318
Solomon, K.A., Nuclear reactor spent fuel valuation: procedure, applications, and analysis, 3:44725 (R—2239-DOE)
Solov'ev, E.A., Classical approximation for the ionization of a negative ion by electron impact near the threshold, 3:45542
Solov'ev, M.I., *See* Angelov, N., 3:45589
Sommer, E., Behaviour of Cracks and its analysis using fracture mechanics, 3:44757 (IAEA—18; CONF-751268—, pp 81-85)
Sonett, C.P., *See* Albee, A.L., 3:45476
Sorensen, C., *See* Berger, E.L., 3:45636
Sorenson, E., *See* Mayo, D.W., 3:45333
Sorenson, J.A., *See* DeBlanc, H.J. Jr., 3:45384
Soroka, A.M., *See* Rosinskii, S.E., 3:46023
Sorokin, P.V., *See* Miroshnichenko, I.I., 3:45607
Sosnowski, R.A., *See* Hajdu, J., 3:44520
Soto, P.S., Geothermal field of Cerro Prieto on the San Jacinto Fault and its possible extension towards the Imperial Fault, 3:44573 (UCRL-Trans—1547)
Soukup, J., *See* Hoffman, G.W., 3:45702
Southward, A.J., Recolonization of rocky shores in Cornwall after use of toxic dispersants to clean up the Torrey Canyon spill, 3:44180
Southward, E.C., *See* Southward, A.J., 3:44180
Souto, J., *See* Keller, G.V., 3:44570
Sowdon, T.L., *See* Warman, E.A., 3:44830
Sowerby, M.G., *See* McKay, H.A.C., 3:44279
Sparrow, D.A., *See* Rost, E., 3:45684
Spasskii, A.V., *See* Teplov, I.B., 3:45804
Spatschek, K.H., Filamentation of lower-hybrid cones, 3:46050
Spencer, C.W., *See* Dodge, H.W. Jr., 3:44224
Spencer, D.L., Thermal, fluid flow, and mechanical charcteristics of a subatmospheric distributed flow flat plate collector, 3:44478 (CONF-761220—, pp 63-71)
Spencer, J.E., *See* Burman, R.L., 3:45697
See Hoffman, G.W., 3:45702
Spencer, R.R., *See* Gwin, R., 3:45773
Sperber, D., *See* Birkelund, J.R., 3:45711
Sperduto, A., *See* Lazzarini, A.J., 3:45699
Spewak, P., *See* Rebibo, K., 3:44348
Spiegelberg, W.D., Investigation of separation-lubrication substances for use in isothermal forging. Final report, 16 December 1974—1 July 1976, 3:45002 (AD-A—048588)
Spiga, G., *See* Boffi, V.C., 3:45819
See Landini, P., 3:45818
Spinka, H., *See* Nasser, M.A., 3:45573
Spinrad, B.I., General correlation for independent fission product yield uncertainties, 3:45774
Spirakis, C.S., Theory for the origin of the Rifle-Garfield vanadium—uranium deposit, 3:44239 (USGS-CIRC—753, pp 8-10)
Spiridonov, V.V., *See* Sapelkin, N.V., 3:45199
Spitale, G.C., *See* Chapman, T.C., 3:45777
Sprague, D.L., *See* Kazmerski, L.L., 3:45114
Springer, R.W., Rate and pressure dependence of contaminants in vacuum-deposited aluminum films, 3:45005
Springer, W., *See* Sachse, K., 3:44764
Sprouse, K.M., Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification, 3:44046 (FE—2518-14)
Sprung, J.L., Investigations of the adequacy of the meteorological transport model developed for the reactor safety study, 3:44811 (SAND—78-0574C)
Spurlock, J.W., *See* Murphy, R.P., 3:44147
Squarci, P., *See* Bernardi, A., 3:44580
Squire, A., *See* Omberg, R.P., 3:44693
Squires, W.R., *See* Payne, J.F., 3:45416
Srinivasan, G., *See* Muller, R.E. Jr., 3:44855
Srivastava, B.N., Visible laser discharge studies. Quarterly progress report, December 1, 1976—February 28, 1977, 3:45163 (COO—2922-1)
Visible laser discharge studies. Quarterly progress report, June 1, 1977—August 31, 1977, 3:45164 (COO—2922-3)
Staats, E.B., Marine approaches to U.S. ports: a flexible and obstruction-free system is needed, 3:44883 (CED—78-107)
Summary of problems associated with coal reserve estimates, 3:44092 (EMD—78-23)
Staeuber, Legislation: energy law. Act amending the third electricity generation act, 3:44145
Stainken, D.M., Effects of uptake and discharge of petroleum hydrocarbons on the respiration of the soft-shell clam, Mya arenaria, 3:45412
Stakhanov, I.P., *See* Igitkhanov, Yu.L., 3:46092
Stalnaker, R.L., *See* Culver, R.H., 3:45386
Stambolis, C., Solar heating and cooling of buildings in Greece with special reference to schools, 3:44407 (CONF-761220—, pp 109)
Stamper, J.A., Studies of spontaneous magnetic fields in laser-produced plasmas by faraday rotation, 3:45914

Stamulis, A., The 1976 NRL air quality data. Final report, 3:45289 (AD-A—048750)
Stanley, D., *See* Petrovich, F., 3:45794
Stanyukovich, K.P., *See* Ivanov, M.Y., 3:45807
Stark, A.H., *See* Hardesty, D.R., 3:44136
Stark, W.A. Jr., Diffusion coefficient determination using a size-variation technique, 3:45833
Starodub, A.N., *See* Bychenkov, V.Y., 3:45918
Startsev, V.I., Concentration dependence of the softening effect in Pb—Sn and Pb—Bi alloys at the superconducting transition point, 3:45019
Staselko, D.I., *See* Aristov, A.V., 3:45198
Stauffer, H.C., *See* Murphy, H.C. Jr., 3:44171
Stauffer, J.D., LCL: a compiler and language for logical mask checking, 3:45229 (SAND—77-2031)
Staveloz, P., Precise measurement of the capture width of the 6.67-eV neutron resonance of uranium-238, 3:45770
Stavrov, A.A., *See* Burakov, V.S., 3:45922
Steadman, S.G., *See* Lazzarini, A.J., 3:45699
Steck, G.P., *See* Sprung, J.L., 3:44811
Steele, J.W., N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX—613-1955(Rev.))
Stefani, G., *See* Bernardi, A., 3:44580
Stefanski, R., *See* Wanderer, P., 3:45570
Stegeman, J.J., Influence of environmental contamination on cytochrome P-450 mixed-function oxygenases in fish: implications for recovery in the Wild Harbor Marsh, 3:45419
Stegen, G.E., *See* Moore, R.H., 3:44031
Steiger, A.D., *See* Pexton, R.L., 3:46145
Stein, L., *See* Schroeder, H.W., 3:45189
Stein, N., *See* Riley, P.J., 3:45704
Steinberg, D.J., *See* Mao, H.K., 3:45270
Steinman, D.K., ^{252}Cf-based borehole logging system for in-situ assaying of uranium ore, 3:44235 (USGS-CIRC—753, pp 72-73)
Steinmetz, L.L., Mode-locked krypton ion laser with a 50-psec pulse width in the near uv, 3:45171
Stenbaek-Nielsen, H.C., *See* Wescott, E.M., 3:45484
Stenchikov, G.L., *See* Andreev, N.E., 3:46025
Stenger, V.J., *See* Bell, J., 3:45567
Stenholm, S., *See* Salomaa, R., 3:45187
Stepanenko, M.M., *See* Aglitskii, E.V., 3:45916
Stepanov, B.I., *See* Kuntsevich, B.F., 3:45204
Stephan, K., Cooling of solid particles with irregularly shaped surfaces, 3:44076
Stephanakis, S.J., *See* Mosher, D., 3:45933
Stephansson, O., Deformation of a jointed rock mass, 3:44297 (ORNL-tr—4567)
Stephens, D.R., LLL in situ coal gasifiction program. Annual report Fiscal Year 1977, October 1976—September 1977, 3:44055 (UCRL—50032-77)
See Aiman, W.R., 3:44056
Stephens, F.B., Feasibility study for computerized automation of EPA Region II Technical Support Branch, 3:45303 (UCRL—52426)
Stephens, F.S., *See* Guidry, M.W., 3:45748
Stephenson, R.B., *See* McKeen, T.R., 3:44508
Stepin, E.V., *See* Balabanova, L.A., 3:45074
Stevens, D.F., Computer performance management at LBL, 3:46141 (UCID—3994)
Nine-fold way: a tutorial in successful performance management, 3:46138 (LBL—7256)
Stevens, R., *See* Chadwick, G.B., 3:45585
Stevens, W., *See* Diamond, S., 3:44422
Stevenson, M.L., *See* Bell, J., 3:45567
Stevenson, S., *See* Robinette, S.L., 3:45000
Stewart, J.E., Distribution and abundance of hydrocarbon-utilizing bacteria in sediments of Chedabucto Bay, Nova Scotia, in 1976, 3:45408
Stewart, O.W., Clean coal combustion through coal washing and blending, 3:44126 (PB—274406)
Steyert, W.A., High-conductivity high-specific-heat copper for cryogenic applications, 3:45142
Steyn, J.J., *See* McLeod, N.B., 3:44276
Stiegler, J.O., *See* Yoo, M.H., 3:45056
Stirling, W.L., *See* Whealton, J.H., 3:45250, 3:46103
Stix, T.H., Plasma transport across a braided magnetic field, 3:45962
Stock, L.M., Coal anion structure and chemistry of coal alkylation. Fourth quarterly progress report, December 1, 1977—February 28, 1978, 3:44074 (COO—4227-4)
Stockhoff, E.H., *See* Frost, R.T., 3:44359
Stoenner, R.W., *See* Bahcall, J.N., 3:45453
Stokes, E.D., *See* Chu, T.L., 3:44369
Stokes, R.H., *See* Plasil, F., 3:45746
Stoltz, R.E., *See* Johnson, H.R., 3:45014
Stone, C.M., Leakage effects on LMFBR cell liners, 3:44813 (SAND—78-0742C)
Stone, R.G., Design and construction of Diamond Turning Machine No. 3, 3:45135 (UCRL—50016-78-1, pp 6-11)
Liquid-natural-gas spill-effects program, 3:44195 (UCRL—50016-78-1, pp 1-5)
Mechanical Engineering Department quarterly report, January—March 1978, 3:45132 (UCRL—50016-78-1)
Proof test of the ATLAS Trailer Shock Isolation System, 3:45284 (UCRL—50016-78-1, pp 15-20)
Small-scale modeling of vertical loads for the boiling-water-reactor pressure-suppression system, 3:44816 (UCRL—50016-78-1, pp 12-14)
Storm, E.K., Exploding pusher experiments utilizing a 4π illumination system, 3:46118
Stowers, I.F., Advances in cleaning metal and glass surfaces to micron-level cleanliness, 3:45182
Stoyanova, D.A., *See* Antipov, Y.M., 3:45586
Strakhovenko, V.M., *See* Katkov, V.M., 3:45610
Strand, L.L., Solar heat collecting porous building blocks, 3:44532
Strauss, B.P., *See* Carrigan, R.A. Jr., 3:45578
Strehler, A., Producing energy from straw and wood waste, 3:44339
Strier, M.P., *See* Schafer, C.J., 3:45356
Strigun, V.E., *See* Aristov, A.V., 3:45198
Strikman, M.I., Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
Stringer, J.L., Apparatus for measuring a flux of neutrons, 3:44623
Strizhko, L.P., *See* Peskovatskii, S.A., 3:45145
Stroganov, A.A., *See* Abagjan, A.A., 3:45824
Strohschein, H., *See* Poettken, H.G., 3:44961
Strokin, N.A., *See* Koshilev, N.A., 3:45896, 3:45942
Stroscio, M.A., Suprathermal electrons in a laser-heated plasma: a theoretical temperature relationship, 3:45929
Stroud, H.T.F., Hydrogen or methane: future processes for the production of SNG, 3:44057
Struble, G.L., Levels in ^{189}Ir and ^{191}Ir observed in the (p,t) reaction, 3:45747
Struckzinski, W., *See* Cobb, J.H., 3:45559
Stumer, I., *See* Cobb, J.H., 3:45559
Stump, D.R., Equivalence of worlds with different θ values in massless quantum chromodynamics, 3:45658
Interpretation of small variations of an n-pseudoparticle solution, 3:45671
Sturm, R., *See* Sayer, R.O., 3:45750
Stutte, L., *See* Barish, B.C., 3:45566
See Merritt, F.S., 3:45569
Stwalley, W.C., *See* Crooks, J.B., 3:45523
See Zemke, W.T., 3:45492, 3:45493
Stwerka, L.J., *See* Moerzer Bruijns, N.F., 3:45366
Su, S., *See* Sund, R.E., 3:44660
Su, S.F., Comparisons of sodium void and Doppler reactivities in large oxide and carbide LMFBRs, 3:44687 (ANL—78-41)
Subramanian, G., Radiopharmaceuticals, 3:45391
Suchannek, R., *See* Todd Baker, F., 3:45755
Suchkov, A.A., Role of the H_3^+ molecular ion in the formation of stars from hot matter with a primordial chemical composition, 3:45445
See Marsakov, V.A., 3:45466
Suchomel, R.R., Design study for a 24-cm HTGR microsphere coating furnace, 3:44261 (ORNL/TM—6321)
Progress on sol-gel sphere-pac development, 3:44259 (CONF-780535—1)
Suckewer, S., Rapid scanning of spatial distribution of spectral line intensities in PLT tokamak, 3:45935 (PPPL—1430)
Sudo, S., *See* Sato, K.N., 3:46122
Sugai, H., Ion wave excitation by radiation pressure in a plasma waveguide, 3:46053
Sugawara, T., JFT-2 tokamak neutral injector and preliminary results of additional heating experiment, 3:46102 (JAERI-M—7043)
Sugihara, R., Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma, 3:46036 (N—77-33980)
Sugimoto, Y., *See* Kikuchi, M., 3:44298
Suiter, R.L., *See* Spencer, D.L., 3:44478
Sukenobu, S., *See* Akaishi, K., 3:46133
Sulak, L., *See* Wanderer, P., 3:45570
Suleimanov, M., *See* Angelov, N., 3:45589
Sullivan, R.F., Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July—September 1977, 3:44065 (FE—2315-19)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, October—December 1977, 3:44208 (FE—2315-22)
Sulton, A.L. Jr., *See* McBride, J.B., 3:46009
Sumino, K., Methylmercury analysis (a review and some data), 3:45341
Summers, J.C., *See* Klimisch, R.L., 3:44992
Sun, C.T., High pressure steam pipe, 3:44617 (PB—274758)
Sund, R.E., Calculations of neutron radiation levels from HTGR spent fuel, 3:44660
Sundaram, A.K., *See* Sinha, M., 3:46049
Sung Sheng Chang, Path-integral quantization of solitons using the zero-mode Feynman rule, 3:45663
Sunier, J.W., *See* Ajzenberg-Selove, F., 3:45742
Sunyar, A.W., *See* Kistner, O.C., 3:45749
Sureau, A., *See* Jaegle, P., 3:45216
Susov, A.M., *See* Kravtsov, N.V., 3:45206
Suter, H., *See* Merritt, F.S., 3:45569
Suter, M., *See* Vane, C.R., 3:45534

Sutherland, H.J., Acoustical determination of the shear relaxation functions for polymethyl methacrylate and Epon 828-Z, 3:45077
Suydam, B.R., Breakup of an accelerated shell owing to Rayleigh—Taylor instability, 3:45832 (LA—7291-MS)
Suzuki, I., *See* Kawai, M., 3:44702
Suzuki, T., *See* Arima, A., 3:45693
Suzuki, Y., *See* Itagaki, T., 3:45901
See Matoba, T., 3:45902
See Takano, I., 3:46095
Swain, J.E., *See* Storm, E.K., 3:46118
Swanson, D.A., Solar air conditioning system, 3:44446
Swartman, R.K., Solar-assisted heat pump for northern latitudes, 3:44416 (CONF-761220—, pp 165)
Sweeney, M.A., Thick-shell shock-focusing electron beam targets, 3:46112
Sweet, C., Hidden costs of nuclear energy, 3:44719
Swegle, J.W., Suggested technique for determining in-material longitudinal and shear particle velocity histories in a single-inclined-plate impact experiment, 3:45137
Swenson, L.W., *See* Zeidman, B., 3:45700
Swift, R.P., Effect of simultaneous and sequential detonation on explosive-induced fracture, 3:45076 (UCRL—80390)
Sylvestre, Y., *See* Pettigrew, M.J., 3:44671
Syrovatskii, S.I., *See* Molodenskii, M.M., 3:45459
Syunyaev, R.A., Fluctuations in the primordial background radiation induced by secondary ionization of matter in the universe, 3:45469
See Pozdnyakov, L.A., 3:45437
Szalata, Z.M., *See* Arnold, R.G., 3:45687
Sze, R.C., 1/4-J discharge pumped KrF laser, 3:45178
See Loree, T.R., 3:45209
Sze, W.C., *See* Hillhouse, D.L., 3:44631

T

Tabor, H.Z., Solar collectos, 3:44530
Vacuum solar collectors, 3:44531
Tabor, S.L., Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
See Davids, C.N., 3:45721
Tai, C.Y., Desulfurizing coal with solutions containing dissolved oxygen, 3:44029 (IS-ICP—48)
Taits, E.M., Plastic properties of coals and their briquetting, 3:44130
Takaesu, K., Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP—22298)
Takahashi, R., *See* Thein, A., 3:45932, 3:45941
Takamoto, T., *See* Fukumura, T., 3:45944
Takano, I., Three-dimensional analysis of eddy current with the finite element method, 3:46095 (JAERI-M—7062)
Takashima, T., Simulation of drive characteristics of JT-60 movable limiter, 3:46125 (JAERI-M—7130)
Takeda, H., *See* Weisberg, H., 3:45582
Takeda, S., *See* Sugai, H., 3:46053
Takeuchi, K., *See* Ueki, K., 3:45154
Takeuchi, M., *See* Kawagoshi, H., 3:44162
Takibaev, N.Z., Sum rules for elastic nd scattering, 3:45686
Takino, T., *See* Kawamoto, T., 3:44299
Talbot, A.F., *See* Schneider, A., 3:44064
Talbot, R.B., World food problem and U.S. food politics and policies: 1972—1976, 3:44865
Talmadge, S., *See* Schwirzke, F., 3:45885
Talmage, S.S., Thermal effects on aquatic organisms: an annotated bibliography of the 1976 literature, 3:45406 (ORNL/EIS—124)
Tamanini, R.J., Windmill with radial vanes, 3:44604
Tamas, G., *See* Arnold, R.G., 3:45687
Tamor, S., Absorption coefficient of a magnetized plasma for cyclotron radiation, 3:46051
Tanenbaum, W., Radiative decays of the psi (3684) into high-mass states, 3:45602
See Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
Tang, H.H.K., *See* Wong, C., 3:45780
Tang, W.M., *See* Koch, R.A., 3:46045
Tange, T., Diffusion of a multi-ion species plasma due to drift wave fluctuations, 3:45946 (N—77-33984)
See Hatori, T., 3:45949
Taniguchi, T., *See* Otaka, H., 3:44287
Tanis, J.A., Target-thickness dependence of radiative electron capture in heavy-ion collisions, 3:45529
Taniuti, T., *See* Nishihara, K., 3:45899
Tannenwald, P.E., *See* Fetterman, H.R., 3:45907
Tanner, A.B., Assay for uranium and measurement of disequilibrium by means of high-resolution gamma-ray borehole sondes, 3:44227 (USGS-CIRC—753, pp 56-57)
Tanno, M., Method for treating radioactive waste water, 3:44283
Tarter, C.B., *See* Post, D.E., 3:45965
Tatsenko, O.M., Rotation of the plane of polarization in EuO subjected to very high magnetic fields, 3:45071
Tatsumi, Masanori, *See* Morimoto, Giroshi, 3:44173
Tavoni, R., *See* Prosperi, M., 3:44701
Taylor, F.E., *See* Duke, D.W., 3:45604
Taylor, J.M., *See* Smith, D.R., 3:44272
Taylor, M.F., *See* Picket, P.E., 3:45242
Taylor, R.J., *See* Schwirzke, F., 3:45885
Taylor, T.N., *See* Ellis, W.P., 3:45012
Teilhet, A., *See* Snapp, P.C., 3:44645
Telkes, M., *See* Kando, P.F., 3:44562
Tellinghuisen, J., Spectroscopic studies of diatomic noble gas halides. III. Analysis of XeF 3500 A band system, 3:45175
See Tellinghuisen, P.C., 3:45176
Tellinghuisen, P.C., Spectroscopic studies of diatomic noble gas halides. IV. Vibrational and rotational constants for the X, B, and D states of XeF, 3:45176
See Tellinghuisen, J., 3:45175
Teloeken, R., *See* Koch, H., 3:44127
Teplov, I.B., Backward peaks of the cross section in nuclear reactions and exchange processes, 3:45804
See Zelenskaya, N.S., 3:45799
Ter-Pogossian, M.M., Reconstruction tomography in diagnostic radiology and nuclear medicine, 3:45382
See Phelps, M.E., 3:45383
Terada, K., *See* Kiba, T., 3:44574
Terai, R., Chemical durability of glasses suitable for the storage of high level radioactive wastes. I. On the mechanism of dissolution of the glasses of borax-alumina-silica system in water, 3:44300 (ORNL-tr—4626)
Self diffusion of calcium ions in soda lime and slag glasses, 3:45120 (ORNL-tr—4627)
See Kawamoto, T., 3:44299
Terashima, Y., *See* Dodo, T., 3:46030
See Nishi-kawa, K.I., 3:45950
Tewhey, J.D., Distribution of uranium in sediment samples as determined by multi-element analysis, 3:44221 (USGS-CIRC—753, pp 43-44)
Thackray, M., Sources of nuclear radiation, 3:44322
Thackston, M.G., *See* Pope, W.M., 3:45093
Thangam, S.G., *See* Chen, C.F., 3:44564
Thein, A., Instability enhanced emissions of x-ray and neutron in plasma focus, 3:45941
Neutron yield enhancement in a CO_2 laser irradiated plasma focus, 3:45932
Thern, R., *See* Weisberg, H., 3:45582
Theus, R.B., *See* Share, G.H., 3:45256
Thiessen, H.A., *See* Hoffman, G.W., 3:45702
See Zeidman, B., 3:45700
Thoe, R.S., *See* Vane, C.R., 3:45534
Thomas, E.W., Excited state formed by B^+ impact on metallic Cu and Mo, 3:45058
Thomas, G., High resolution and high voltage electron microscopy at the University of California, Berkeley, 3:45010 (LBL—6998)
Thomas, J.T., Review of criteria for nuclear criticality safety control in transportation, 3:44273 (CONF-780506—22)
Thomas, M.L.H., Comparison of oiled and unoiled intertidal communities in Chedabucto Bay, Nova Scotia, 3:45410
Thomas, T.D., *See* Vandenbosch, R., 3:45734
Thome, F.V., Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples, 3:44812 (SAND—78-0718)
Thompson, C.E., *See* Mannion, W.A., 3:44982
Thompson, J.A., *See* Herbert, M.L., 3:45568
Thoms, W., *See* Lazzarini, A.J., 3:45699
Thomsen, O.J., *See* Chon, W.Y., 3:44802
Thomson, J.J., *See* Bernstein, I.B., 3:45954
Thornton, D.E.J., *See* Burstall, R.F., 3:44738
Thornton, S.T., *See* Doering, R., 3:45715
Thorsness, C.B., *See* Aiman, W.R., 3:44056
Tiberghien, E., Economic significance of the use of electric heat, 3:44935
Tibilov, V.K., *See* Alferov, Z.I., 3:45194
Tikhonchuk, V.T., *See* Bychenkov, V.Y., 3:45918, 3:46017
Tilinin, G.N., High-frequency plasma waves in a Hall accelerator with an extended acceleration zone, 3:46073
Tilley, D.R., *See* Weller, H.R., 3:45727
See Wender, S.A., 3:45706
Timerov, R.K., Coexistence of the dielectric and superconducting states in quasi-one-dimensional systems, 3:45844
Timofeev, I.G., Data preparation for calculations with the Monte-Carlo method on the base of the 26-group constant system, 3:44733 (IAE—2526)
Timofeev, M.A., *See* Andreeva, M.N., 3:46019
Timofeev, V.A., *See* Artemov, K.P., 3:45713
Timofeyeva, V.A., *See* Derkachenko, V.N., 3:45098
Tinsley, J., *See* Hoffman, G.W., 3:45702
Tisone, G.C., *See* Tellinghuisen, J., 3:45175
Tkachenko, V.F., *See* Ladikov, Y.P., 3:46015
Todd, J.H., *See* Gwin, R., 3:45773
Todd, T.E., Criteria for uses of built-in exposure rate and airborne radioactivity monitoring systems in nuclear power plants, 3:44829
Todd Baker, F., $^{192}Pt(\alpha,\alpha')$ reaction at E = 24 MeV, 3:45755
Todreas, N.E., Fuel—Coolant Thermal Interaction Project. Progress report No. 8, 3:44799 (COO—2781-14)

See Glazer, S., 3:44689
Toepfer, A.J., *See* Shope, S., 3:45248
Tofaute, K., Hygienization of sewage sludge by electron irradiation, 3:44968
Toffer, H., Fuel storage basin: criticality safety analysis report and technical basis, 3:44789 (DUN-NUSAR—7824)
Tokosugu, T., Report of geothermal multi-purpose utilization inspection tour, 3:44571 (NP—22301)
Tolmachev, Y.A., *See* Bagaev, S.A., 3:45515
Tolstenkov, A.N., *See* Likhoded, A.K., 3:45635
Tomaszewski, A., *See* Mogilnicka, E.M., 3:45420
Tomkins, F.S., *See* Fonck, R.J., 3:45509
Tomov, I.V., *See* Richardson, M.C., 3:45930
Tompkins, F.C., *See* Bond, G.C., 3:45119
See Harland, J.R., 3:44061
Toneyev, V.D., *See* Barashenkov, V.S., 3:45798
Tormo Ferrero, M.J., *See* Acena Barrenechea, M.L., 3:45128
Toth, K.S., *See* Gross, E.E., 3:45712
Towne, R.A., *See* Parker, J.H. Jr., 3:45139
Townley, C.H.A., *See* Dowling, A.R., 3:44749
Tracy, D.H., *See* Fonck, R.J., 3:45509
Traeger, R.K., DEEP STEAM: Project 16 enhanced oil recovery. Quarterly report, October 1—December 31, 1977, 3:44153 (SAND—78-0313)
Fossil Energy Development Programs. Quarterly report, October 1—December 31, 1977, 3:44052 (SAND—78-0653)
Tragitt, G., *See* Reimers, R.S., 3:45344
Trakhtengerts, V.Y., *See* Bespalov, P.A., 3:46022
Trapp, J.P., *See* Estiot, J.C., 3:44705
Trautner, N., *See* Christensen, P.R., 3:45745
Travaglini, N., *See* Prosperi, M., 3:44701
Trayanov, R., *See* Angelov, N., 3:45588
Treneva, E.G., *See* Andreeva, M.N., 3:46019
Trenholme, J., Fusion laser development at the Lawrence Livermore Laboratory, 3:46123
Trifan, A.T., *See* Palistrant, M.E., 3:45047
Trilling, G.H., *See* Jaros, J.A., 3:45561
See Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Tripp, R.D., *See* Alston-Garnjost, M., 3:45583, 3:45584
Trippe, T.G., *See* Jaros, J.A., 3:45561
Trofimova, V.G., *See* Biryhkov, Yu.V., 3:44077
Trostnikov, A.A., *See* Posylnyi, V.Ya., 3:44079
Truby, F.K., Spontaneous explosions in multiatmosphere H_2-F_2-O_2 mixtures, 3:45177
Trujillo, A., *See* Davis, T.O., 3:45147
Truong, H.V., *See* Villanueva, J., 3:44490
Trushin, S.A., *See* Kuntsevich, B.F., 3:45204
Tsai, C.C., *See* Whealton, J.H., 3:45250, 3:46103
Tsai, M., Electrical properties of n-type epitaxial indium phosphide films, 3:44367
Tsai, S., Coordinate-space formalism of the random-phase approximation, 3:45779
Tsang, K.T., Turbulence theory for the dissipative trapped electron instability, 3:45998
See Catto, P.J., 3:45877
Tsay, Y.J., Solar powered distilling device, 3:44473
Tseitlin, V.Y., Reduction of the direct product of irreducible representations of the supersymmetry group in the rest frame, 3:46146
Tsiitsivadze, E.T., *See* Angelov, N., 3:45589
Tsirkel', B.I., *See* Baksht, F.G., 3:45926, 3:45927
Tskhakaya, V.K., *See* Zykov, B.M., 3:45032
Tsubosaka, A., Mock-up experiment of radiation streaming through coolant pipe penetration, 3:44792
Tsuji, H., *See* Sato, K.N., 3:46122
Tsukishima, T., *See* Mase, A., 3:46035
Tsygan, A.I., Radio pulsar model, 3:45444
Tsytovich, V.N., *See* Akopyan, A.V., 3:46079
Tudron, T.N., *See* Creutz, M., 3:45664
Tulina, N.A., *See* Polovov, V.M., 3:45041
Tullis, R.E., Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL—13849)
Tunnicliffe, P.R., *See* Schriber, S.O., 3:45246
Turchi, P.J., *See* Book, D.L., 3:46098
Turk, M., Dirt feedlot residue experiments. Quarterly progress report, October 1, 1977—November 30, 1977, 3:44386 (COO—2952-16)
Turkevich, A.L., *See* Dabrowski, A.J., 3:45255
Turner, J.E., *See* Arora, D., 3:45530
Turner, M.D., *See* Clarkson, T.W., 3:45423
Turovtsev, V.V., *See* Bogdanov, P.V., 3:45051
Tutov, V.I., *See* Lazarev, B.G., 3:45045
Tuvdendorzh, D., *See* Angelov, N., 3:45589
Tyutyunnik, V.B., *See* Bratashevskii, Y.A., 3:45097

U

Ueda, K., *See* Fujino, H., 3:45140
Ueda, N., *See* Yamamoto, S., 3:45938
Ueki, K., Examination on neutron shielding for a spent fuel shipping cask, 3:45154
Uemura, H., *See* Kumamoto, S., 3:44592
Ueno, K., *See* Fisk, R.J., 3:45575
Ugrin, S.Y., *See* Aleksakhin, I.S., 3:45540
Uhl, A.E., High-value energy needs more efficient conversion, transport, 3:44128
Uhl, D.L., *See* Shaw, R.A., 3:44638
Uhm, H., *See* Goren, Y., 3:45996
Uhrmacher, M., *See* Hellmeister, H.P., 3:45726
Uiblacker, K., Storage of solar energy in the ground, 3:44566
Ul, J., *See* Doi, R., 3:45348
Ulehla, M., Some effects of anisotropic vibrations in LEED, 3:45837
Unsworth, G.N., Decommissioning of CANDU nuclear stations, 3:44665 (AECL—5800, pp 49-67)
Uralov, A.M., Rope structure of a magnetic field rising to the solar surface, 3:45458
Some polarization features of microwave bursts on the sun, 3:45462
Urbanek, A., Europe's biggest solar house stands in Swabia. Hot water supply and space heating in 'Heggbach', a home for the disabled, 3:44450
Urbanek, R.J., *See* Browne, T.E., 3:44876
Urenev, V.I., *See* Pokatilo, Y.M., 3:45061
Urin, M.G., Photoneutron reactions near threshold and the optical model of nuclei, 3:45805
Usnick, G.B., *See* Lewis, H.E., 3:44062, 3:44063
Ussar, M., *See* Poettken, H.G., 3:44961
Utrobin, V.P., Postmaximum phases of the light curves of type I supernovae, 3:45443

V

Vahala, G., *See* Tsang, K.T., 3:45998
Vaidyanathan, R., Coarse mesh algorithm to solve neutron transport equation in thick shields, 3:44767
Vainberg, L.I., *See* Baksht, F.G., 3:45926, 3:45927
Vainshtein, A.I., Charmonium and quantum chromodynamics, 3:45673
Valiknac, T., *See* Neufeld, R.D., 3:44085
Valkar, S., *See* Amaglobeli, N.S., 3:45587
Van't Hof, J., 18 μm replication units of chromosomal DNA fibers of differentiated cells of pea (Pisum sativum), 3:45372
Van Berg, R., *See* Weisberg, H., 3:45582
van Dalen, A., *See* McKay, H.A.C., 3:44279
van der Donckt, Health. The risks assessment, 3:45263
Van Dine, L.L., Pressurized high temperature fuel cell power plant with bottoming cycle, 3:44912
Van Ginneken, A., *See* Chen, K.W., 3:45615
Van Heusden, R., *See* Nicks, R., 3:46093
Van Konynenburg, R.A., *See* Nethaway, D.R., 3:45741
Van Osdell, D., Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB—266103)
van Schaik, N., *See* Coolen, F.C.M., 3:45982
Van Vleet, E.S., Contribution of chronic petroleum inputs to Narragansett Bay and Rhode Island Sound sediments, 3:45335
Vandenbosch, R., Elastic and deeply inelastic reactions in the $^{86}Kr + ^{139}La$ system at 505, 610, and 710 MeV, 3:45734
Vandenbroek, C.J.J., *See* Frederick, J.R., 3:45223
Vander Plas, H.A., *See* Nelson, N.J., 3:44366
Vanderborgh, N.E., *See* Wagner, P., 3:44050
Vandermeulen, J.H., Absence of aryl hydrocarbon hydroxylase (AHH) in three marine bivalves, 3:45376
See Keizer, P.D., 3:44177
VanDevender, J.P., Resistive phase of a high-voltage water spark, 3:45249
See Shope, S., 3:45248
Vane, C.R., Z, velocity, and charge dependence of zero-degree electron "cusps" from charge transfer to continuum states of bare and highly ionized projectiles, 3:45534
Vanek, V., *See* Gekelman, W., 3:45911
Vannucci, F., *See* Tanenbaum, W., 3:45602
Varga, T., C.O.D. Measuring technique on CT-specimens as applied in the Sulzer Laboratories, 3:44758 (IAEA—18; CONF-751268—, pp 207-209)
Non-destructive testing, fracture mechanics and defect tolerances, 3:44759 (IAEA—18; CONF-751268—, pp 267-270)
Varghese, P., *See* Hoffman, G.W., 3:45702
Varma, M.N., Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison, 3:45827 (BNL—24330)
Varnado, G.B., Fault tree analysis for vital area identification, 3:44312 (SAND—78-0364C)
Varnado, S.G., *See* Newsom, M.M., 3:44596
Varshalovich, D.A., *See* Khersonskii, V.K., 3:45465

Vartanyan, Y.L., Nuclear matter with the retention of neutrinos, 3:45449
Vartapetyan, G.A., *See* Asaturyan, V.M., 3:45563
Vartsky, D., *See* Ellis, K.J., 3:45379
Vashishta, P., Ionic motion in α-AgI, 3:45094
Vechernin, V.V., *See* Braun, M.A., 3:45644
Vedeneev, S.I., High-frequency properties of superconducting weak couplings, 3:45037
Veeser, L.R., Studies of laser-driven shock waves in aluminum, 3:45981
Vekshtein, G.E., Dimensional estimates of the cooling time of a plasma with $\beta >> 1$, 3:45893
Velarde, G., Analysis of the eigenvalue equations in k, λ, γ, and α applied to some fast- and thermal-neutron systems, 3:44736
Velazco, J.E., *See* Tellinghuisen, P.C., 3:45176
Velde, J.C.V., *See* Bell, J., 3:45567
Verdeau, J.J., System for the emergency injection of liquid into a nuclear reactor core, 3:44652
Vereshchagin, L.F., Critical magnetic fields of superconducting compounds based on Nb_3Ge obtained at high pressures and temperatures, 3:45035
Verhoeven, J.D., Superconducting properties of in situ prepared Nb-Cu-Sn alloys, 3:45021
Verkerk, B., *See* McKay, H.A.C., 3:44279
Vermaseren, J.A.M., *See* Smith, J., 3:45599
Vernov, S.N., Fiftieth anniversary of a fundamental discovery in cosmic-ray physics, 3:45438
Veziroglu, T.N., Solar cooling and heating: a national forum. Proceedings of condensed papers, 3:44402 (CONF-761220—)
Viano, D.C., *See* Culver, R.H., 3:45386
Videlbaek, F., *See* Christensen, P.R., 3:45745
Viehboeck, F.P., Solar energy system of the Institute of Molecular Biology, Salzburg of the Austrian Academy of Science, 3:44418 (CONF-761220—, pp 191-194)
Vielstich, W., Alternative paths of energy supply - physical-chemical contributions, 3:44918
Vigdor, S., *See* Henning, W., 3:45740
Vikhrev, V.V., Simple model for the evolution of the plasma focus, 3:45973
Vilcu, N., *See* Naskidashvili, I.A., 3:45064
Villa, F., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Villanueva, J., Design and operational evaluation of a non-tracking solar concentrator, 3:44490 (CONF-761220—, pp 215-221)
Vines, S., *See* Kirwan, D.J., 3:44133
Vinitskii, S.I., Schroedinger perturbation theory in the adiabatic representation of the three-body problem, 3:45521
Vinnikov, L.Y., Vortex pinning on grain boundaries in Pb—In alloys, 3:45049
Vinogradov, A.P., *See* Biberman, L.M., 3:46021
Vinogradov, A.V., Effect of collisions on the intensities of the dielectron satellites of resonance lines of hydrogenlike ions, 3:45928
Vinogradov, V.B., *See* Amaglobeli, N.S., 3:45587
See Budagov, Y.A., 3:45590
Viramonte, J.G., Active volcanoes and their relation to geothermal energy, 3:44569 (NP—22160)
Virtes, G.J., *See* Cumming, J.B., 3:45733
Visscher, W.M., *See* Lumpkin, M.E., 3:45556
Vitray, R., *See* Rebibo, K., 3:44348
Vladimirov, Y.V., *See* Nemashkalo, A.A., 3:45735
Vlasenko, V.G., *See* Kuplennikov, E.L., 3:45709
Voelker, P., System for storage and use of solar energy, 3:44505
Vogel, G.J., Supportive studies in fluidized-bed combustion. Quarterly report, July—September 1977, 3:44131 (ANL/CEN/FE—77-8)
Vogler, A., Photochemical aspects of solar energy conversion, 3:44391
Vogt, G., Source of ignition 'hot surfaces', 3:45131
Vogt, H.G., Intercomparison of Monte Carlo calculations and measurements of the neutron and gamma-ray-streaming in multi bent ducts, 3:44741
Vogt, K.J., *See* Brenk, H.D., 3:45319
Voigt, A., Section I. Tension analysis of the system nickel monosulfide/nickel disulfide/sulfur, 3:45121 (UCRL-Trans—11350)
Voitsenya, V.S., Effect of alternating electric fields on the diffusion of collisionless plasma in the Saturn stellarator, 3:45939
Volk, A., Experience gained with the regulation on HP gas pipelines, issued on December 17, 1974, 3:44197
Volk, R., *See* Hohla, K., 3:45212
See Witte, K., 3:45213
Volkov, A.D., Current-density distribution in a long cylindrical thermionic converter, 3:44906
Volkov, G.G., Possible existence of a weak V+A lepton-lepton interaction, 3:45623
See Baranov, D.S., 3:45571
Volkov, T.F., Kinetics of neutral atoms near the wall of a fusion reactor and impurity formation, 3:45967
Volkova, L.M., Plasma space potential, 3:45925
Vollrath, K., Photographic study of rapid events by picosecond techniques, 3:45904 (N—77-33495)
Volod'ko, A.G., *See* Amaglobeli, N.S., 3:45587
See Budagov, Y.A., 3:45590
Voloshin, M.B., *See* Vainshtein, A.I., 3:45673
Voloshko, A.Y., *See* Voitsenya, V.S., 3:45939
Volovik, G.E., Investigation of singularities in superfluid He^3 in liquid crystals by the homotopic topology methods, 3:45555
Volta, G., *See* Coudert, C., 3:44804
Von Behren, P.L., *See* Weller, H.R., 3:45727
von Gadow, A., *See* Riedel, H., 3:45318
von Platen, B., Method of recovering energy by means of a cyclic thermodynamic process, 3:45244
Voorhies, J.D., Process for improved carbon-supported hydrodesulfurization catalysts, 3:44159
Vorob'ev, V.S., *See* Biberman, L.M., 3:46021
Voronov, V.M., Electrostatic-probe diagnostics of a weakly ionized plasma in a magnetic field. II, 3:45921
Vrba, J.A., *See* Guidry, M.W., 3:45748
Vu, H., *See* Jean-Louis, M., 3:45099
Vuillemin, V., *See* Jaros, J.A., 3:45561
Vvedenskii, V.L., *See* Vereshchagin, L.F., 3:45035

W

Wade, D.C., *See* Bhattacharyya, S.K., 3:44786
Wadle, R.C., *See* Wolfer, B.M., 3:44939
Wagner, A.F., *See* Das, G., 3:45525
Wagner, P., High-temperature CO_2/O_2—coal reaction rate experiments, 3:44050 (LA—7277-MS)
See Coffin, J.P., 3:45703
Wagner, T., *See* Kamimura, T., 3:46044
Wahl, A.C., *See* Das, G., 3:45505, 3:45525
Wahl, H., *See* Fisk, R.J., 3:45575
Wakabayashi, N., Diffuse neutron scattering in Nb-Zr alloys, 3:45026
Wakatani, M., *See* Grossmann, W., 3:45872
See Hirano, K.I., 3:45873
Walawender, W.P., *See* Fan, L.S., 3:44070
Wald, F.V., Large area silicon sheet by EFG. Fourth quarterly report, October 1, 1977—December 31, 1977, 3:44356 (DOE/JPL/954355—4)
Waldron, W.D., *See* Burchill, R.F., 3:44095
Walker, B.G., *See* Dean, N.R., 3:45251
Walker, J.D., *See* Colwell, R.R., 3:45409
Wall, I.B., *See* Sprung, J.L., 3:44811
Wall, N.S., Modified optical potential for the elastic scattering of complex particles, 3:45796
Wall, P.S., *See* Sawochka, S.G., 3:44647
Wallace, W.C., *See* Hawke, R.S., 3:45089
Wallbaum, H., Speed control apparatus for an internal combustion engine, 3:44977
Wallin, B.W., *See* Steinmetz, L.L., 3:45171
Walsh, J.B., Energy changes due to mining, 3:44117
Walters, W.J., *See* King, P.J., 3:44888
Walton, R.B., Feasibility of nondestructive assay measurements in uranium enrichment plants, 3:44308 (LA—7212-MS)
Wanderer, P., Measurement of the neutral-current interactions of high-energy neutrinos and antineutrinos, 3:45570
Wang, E., *See* Bell, J., 3:45567
Wang, K., Precise measurements of Kα x-ray linewidths in Eu, Tm, and Ta, 3:45511
Wang, L., Classification of SU(2) gauge fields, 3:45665
Wang, L.C., *See* Bunnell, K., 3:45564
See del Papa, C., 3:45611
Wang, W., Experimental study of bank aerodynamics of atmospheric spray cooling systems, 3:44611 (COO—4531-1)
Warburton, E.K., *See* Nathan, A.M., 3:45724
Ward, C.M., *See* Weinstein, B.W., 3:46129
Ward, F.H., *See* Carlson, T.A., 3:45271
Ward, J.T. Jr., Partial-range expansion for multigroup Monte Carlo photon transport, 3:45814
Ward, S.D., *See* Farb, D., 3:44964
Warman, E.A., Digital radiation monitoring system employing distributed microprocessors, 3:44830
Waroquier, M., *See* Heyde, K., 3:45737
Warren, G.B., Power plant, 3:44395
Warren, I.H., In-situ gasification of coal, 3:44058
Warren, W.H. Jr, Photometric study of the Orion OB 1 association. 3: subgroup analyses, 3:45439 (N—77-34062)
Wase, K., Device for filling a container with radioactive wastes, 3:44284
Watanabe, D.S., Block implicit one-step methods, 3:46143
Watanabe, M., Theory for space-time evolution of explosive-type instability, 3:45989 (N—77-33991)
Watanabe, N., *See* Obayashi, H., 3:45888
Watanabe, T., Theory of two-fluid equilibrium of an axially symmetric plasma, 3:45951 (N—77-33997)
See Sanuki, H., 3:45991
Watson, J.S., *See* Fisher, P.W., 3:46131
Watson, T., Up and AteM: Bentley Colliery, 3:44108
Way, K.R., *See* Crooks, J.B., 3:45523
See Zemke, W.T., 3:45492

Way, L.V. Jr., Portable solar cooker and the solar panel used therein, 3:44469
Wayland, J.R., *See* Sprung, J.L., 3:44811
Weaver, H., *See* Gwin, R., 3:45773
Weaver, K.R., Unique characteristics of CANDU nuclear reactors, 3:44666 (AECL—5800, pp 3-9)
Webb, M.P., *See* Vandenbosch, R., 3:45734
Webb, R.A., Recent advances in SQUID NMR techniques, 3:45138 (CONF-780339—3)
Webb, R.C., *See* Cester, R., 3:45576
Weber, G., *See* Chryssomallis, G.S., 3:45123
Weber, J., *See* Britt, H.C., 3:45776
Weber, K.H., Electrical equipment for roller conveyors, 3:44102
Weber, M.J., Magneto-optical properties of KTb_3F_10 and $LiTbF_4$ crystals, 3:45090
Weber, P.M., *See* Budinger, T.F., 3:45393
Weber, W.H., *See* Lewis, H.E., 3:44062, 3:44063
Webster, W.H., Battery and electrochemical systems program summary, FY 1977, 3:44849 (DOE/ET—0014)
Wecksung, G., *See* Bement, T.R., 3:44216
Wegner, H.E., *See* Coffin, J.P., 3:45703
Wehring, B.W., *See* Ingersoll, D.T., 3:45816
Wei, C., Direct observation of the point-defect structure of depleted-zones in ion-irradiated metals, 3:45055 (COO—3158-62)
Wei, J., Optimum distribution of catalytic material on support layers in automotive catalysis, 3:44993
Weicht, U., *See* Friedrich, K., 3:44822
Weidemann, R., Investigations of the corrosion behaviour of aluminium rollbond absorbers, 3:44553
Weidlich, B., Problems arising from the introduction of solar systems in the FRG. Problem identification and remedies, 3:44351
Weiner, R.M., *See* Fowler, G.N., 3:45659
Weinstein, B.W., Simple manipulator for rotating spheres, 3:46129
Weinstein, M., *See* Drell, S.D., 3:45655
Weisang, J.E., Catalyst for the treatment of hydrocarbons with hydrogen and method for its preparation, 3:44169
Weisberg, H., s-dependence of proton fragmentation by hadrons. II. Incident laboratory momenta 30—250 GeV/c, 3:45582
Weisbin, C.R., Application of sensitivity and uncertainty methodology to fast reactor integral experiment analysis, 3:44737
Weisfield, R., *See* Vandenbosch, R., 3:45734
Weiss, G., *See* de Wilde, G., 3:44502
Weiss, M.S., *See* Flocard, H., 3:45695
Weiss, N., *See* Barnett, R.M., 3:45617
See Sikivie, P., 3:45660
Weller, H.R., Angular distribution measurements for radiative capture of fast neutrons by ^{40}Ca, 3:45727
Welling, H., *See* Schroeder, H.W., 3:45189
Wells, J.C., *See* Davis, P.R., 3:44803
Wells, M.G.H., *See* Froes, F.H., 3:45008
Wells, P.B., *See* Bond, G.C., 3:45119
Wenckel, W., *See* Braetter, P., 3:45108
Wendel, I.L., Solar collector, 3:44546
Wendelin, O.P., *See* Poteat, L.E., 3:44486
Wender, S.A., Confirmation of 8^+ assignment to the 11.86 MeV level in ^{24}Mg, 3:45706
See Weller, H.R., 3:45727
Weneser, J., *See* Bahcall, J.N., 3:45453
Wenrich-Verbeek, K.J., Anomalous uranium in the waters of the Rio Ojo Caliente, New Mexico, 3:44236 (USGS-CIRC—753, pp 73-74)
Wensel, R.G., Effects of various treatments on the serviceability of water-immersed carbon-steel ball bearings, 3:44668 (AECL—5823)
Testing of unlubricated water-immersed carbon-steel ball bearings, 3:44669 (AECL—5824)
Werf, S.Y.v.d., *See* Christensen, P.R., 3:45745
Werle, H., *See* Jiang, S.H., 3:45718
Werner, D., Geothermal energy and the lithosphere in the south-west of FRG/Switzerland, 3:44585
Problems of geothermics using the Rhinegraben as an example, 3:44575 (NP—22841)
Wernick, J.H., *See* Chin, G.Y., 3:45016
Wersich, H., Ecologically suitable use of solar energy: building block for an appropriate technology for developing and industrialized countries, 3:44355
Wescott, E.M., Tordo 1 polar cusp barium plasma injection experiment, 3:45484
Wessels, H., Effects of the construction and operation of a coal-fired power station on production and employment rates, 3:44620
Wessol, D.E., Neutronics analysis of the low proliferating gas core reactor, 3:44731 (CONF-780401—7)
Wesson, J.A., Hydromagnetic stability of tokamaks, 3:46012
Westervelt, P.J., Nonlinear sound generation by high energy particles, 3:45861 (COO—3130TA-341)
Westfall, G.D., Energy spectra of nuclear fragments produced by high energy protons, 3:45707
Westmacott, K.H., *See* Thomas, G., 3:45010
Weston, R.E. Jr., *See* Kleinman, L.I., 3:45522
Wewerka, E.M., *See* Wagner, P., 3:44050
Wexler, S., *See* Sheen, S.H., 3:45526
Whealton, J.H., Effect of preacceleration voltage upon ion-beam divergence, 3:45250
Effect of preacceleration on intense ion-beam transmission efficiency, 3:46103
Mitigation of residual space charge ion optics effects in gas cell by adjustment of beam perveance, 3:45501
Wheeler, D.R., *See* Brainard, W.A., 3:45066
Wheelock, T.D., *See* Min, S., 3:44123
See Tai, C.Y., 3:44029
Whipple, E.T.B., *See* Nasser, M.A., 3:45573
Whitaker, J.S., *See* Tanenbaum, W., 3:45602
White, C.W., *See* Narayan, J., 3:45102
White, J.C., Inversion of the Na resonance line by selective photodissociation of NaI, 3:45169
White, J.D., Performance testing of single electrically heated fuel pin simulators for PWR LOCA experiments, 3:44808 (ORNL/NUREG—35)
Whiteside, R., *See* Binkley, J.S., 3:45544
Whitham, G.K., *See* Longua, K.J., 3:44778
Whitledge, T.E., *See* Smith, S.L., 3:45374
Whitman, G.D., *See* Merkle, J.G., 3:44643
Whittaker, J.D., *See* Cester, R., 3:45576
Whitten, C.A. Jr., *See* Hoffman, G.W., 3:45702
Whittle, K.J., *See* Mackie, P.R., 3:44178
Wibberley, G., *See* Davidson, J., 3:44861
Wicklund, A.B., *See* Kramer, S.L., 3:45577
Widner, M.M., *See* Sweeney, M.A., 3:46112
Wieland, J., Planning a bivalent heating system for heating a one-family house, 3:44945
Wierzbicki, J., *See* Alfimenkov, V.P., 3:45690
Wiggins, D.J., Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL—2607)
Wilhelmsson, H., *See* Watanabe, M., 3:45989
Wilhelmy, J.B., *See* Britt, H.C., 3:45776
Wilke, C.R., *See* Carroad, P.A., 3:44388
Wilks, R.S., *See* McLemore, D.R., 3:44260
Willenborg, D.L., *See* Weinstein, B.W., 3:46129
Williams, A.N., Compendium of critiques of JPL report SP-43-17: automotive technology status and projections project, 3:44969 (N—77-33519)
Williams, C.W., *See* Caird, J.A., 3:45162
Williams, J.C., Some observations on the structure of Ti—11.5Mo—6Zr—4.5Sn (beta III) as affected by processing history. Technical report, 3:45007 (AD-A—048772)
See Froes, F.H., 3:45008
Williams, J.M., *See* Wagner, P., 3:44050
Williams, J.R., *See* Damshala, P.R., 3:44495
Williams, S.A., *See* Shih, L.L., 3:45739
Willis, W.J., *See* Cobb, J.H., 3:45559
Wilson, G.V.H., Nuclear techniques for directed emission and swtiched operation of grasers, 3:45219
Wilson, J.S.M., *See* Steinman, D.K., 3:44235
Wilson, L.W., *See* Heckman, H.H., 3:45572
Wilson, W.F., Geology of the Raleigh 1^0 x 2^0 Quadrangle, North Carolina, 3:44212 (GJBX—51(78))
Wilson, W.J., Kaon-electron correlations in the semileptonic decays of D mesons, 3:45613
Wilt, M.J., *See* Goldstein, N.E., 3:44579
Wiltsee, K.W. Jr., Development of the 1975 area source inventory for the state of Illinois. Final report, 3:44878 (PB—274685)
Winegar, J.E., Measurement of crystallographic texture at Chalk River Nuclear Laboratories, 3:45009 (AECL—5626)
Winge, R.K., *See* Haas, J.W. Jr., 3:45112
Winick, H., *See* Lindau, I., 3:45113
Winsberg, L., Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
Winske, D., Particle simulation studies of the lower hybrid drift instability, 3:46005
Winsor, N., *See* Hui, B.H., 3:45956
Winston, R., Ideal flux concentrators with reflector gaps, 3:44499
Winter, N.W., *See* Bender, C.F., 3:45545
Wiquel, A.W., Solar cigarette lighter, 3:44472
Wirsing, E., *See* Wiswall, R., 3:45122
Wisniewski, J.A., *See* Hulme, B.L., 3:46139
Wiss, J.E., *See* Peruzzi, I., 3:45565
See Tanenbaum, W., 3:45602
Wisshak, K., Neutron capture cross-section ratios of ^{240}Pu, ^{242}Pu, ^{238}U, and ^{197}Au in the energy range from 10 to 90 keV, 3:45771
Wiswall, R., Hydrogen isotope exchange in metal hydride columns, 3:45122 (BNL—50755)
Witherell, M.S., *See* Cester, R., 3:45576
Witt, R., Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975—31 March 1977, 3:45001 (AD-A—048485)
Witte, K., Terawatt iodine laser, 3:45213
Witte, K.J., *See* Hohla, K., 3:45212
Wolfenstein, L., Neutrino oscillations in matter, 3:45618
See Bhandari, R., 3:45651
Wolfer, B.M., Preliminary design study of a baseline MIUS, 3:44939 (N—77-34050)

Wolff, U., *See* Schaefer, H., 3:44917
Wolfsberg, K., Sorption—desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA—7216-MS)
Wolga, G.J., Research on molecular lasers. Final report, 1 October 1968—30 September 1976, 3:45159 (AD-A—048643)
Wolinski, W., *See* Nowicki, M., 3:45191
Wolsky, R., *See* Artemov, K.P., 3:45713
Wong, A.Y., *See* Gekelman, W., 3:45911
Wong, C., Dynamics of nuclear fluid. IV. Some spin and isospin properties in the hydrodynamical model, 3:45788
Extended time-dependent Hartree-Fock approximation with particle collisions, 3:45780
See Sidhu, G.S., 3:45826
Wong, S., *See* Lilly, G.P., 3:44819
Wong, S.H., *See* Buder, M.K., 3:44122
Woo, W., Resonant absorption of laser light by a magnetized plasma, 3:45887
Wood, J.C., Review of session V of the ANS topical meeting, St. Charles, Il., USA, May 1977: "Mechanisms for pellet cladding interactions", 3:44771 (AECL—5850)
Wood, J.M., Metabolic cycles for toxic elements in the environment. A study of kinetics and mechanism, 3:45311
Wood, R.F., *See* Narayan, J., 3:44362
Wood, V.E., *See* Schwerzel, R.E., 3:44390
Woodhead, A.D., Ageing changes in the liver of two poeciliid fishes, the guppy Poecilia (Lebistes) reticulata and the Amazon molly, P. formosa, 3:45394
Worden, A.F., *See* Chang, C.M., 3:44465
Wozniak, D.G., *See* Brown, B.S., 3:45057
Wozniak, G.J., Evidence for angular momentum depolarization and for enhanced sequential fission in the reaction $^{197}Au(^{86}Kr, Z_3f)$, 3:45760
Wright, D.C., *See* Fonck, R.J., 3:45509
Wright, T.P., Transport studies of cusp and multichannel REB fusion concepts, 3:46108
Wu, C.H., *See* Spinrad, B.I., 3:45774
Wu, C.R., *See* Crooks, J.B., 3:45523
Wuttke, G.H., *See* Henderson, T.M., 3:44318
Wymore, I.F., *See* Longenbaugh, R.A., 3:44854
Wynne, F.E., *See* Cronauer, D.C., 3:44060

Y

Yabe, T., Electron-flux limitation due to ion acoustic instability, 3:46080
Yag, J.Y., *See* Leonard, R.P., 3:45301
Yakimovich, V.I., *See* Bobykin, B.V., 3:45038
Yakovlev, E.A., *See* Bezaz'yan, A.V., 3:44115
Yakubovskii, O.A., Faddeev's equations and the strong-coupling method, 3:45679
Yakubovskii, O.Y., *See* Kholyavin, I.I., 3:45803
Yamada, Y., *See* Thein, A., 3:45932
Yamaguchi, H., *See* Hattori, T., 3:44974
Yamaguchi, K., *See* Hasegawa, K., 3:45144
Yamakoshi, H., *See* Ueki, K., 3:45154
Yamamoto, S., Behavior of superthermal electrons in the scrape-off layer of DIVA, 3:45938
Yamauchi, M., *See* Kawai, M., 3:44702
Yamazaki, Y., States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
Yan'kov, V.V., *See* Chukbar, K.V., 3:46067
Yan, G., INMACS - An approach to on-line nuclear materials accounting and control in a fuel fabrication environment, 3:44305 (AECL—5902)
Yang, J.Y., *See* Leonard, R.P., 3:45300, 3:45364, 3:45365
Yang, S., *See* Crooks, J.B., 3:45523
Yarba, V.A., *See* Baranov, D.S., 3:45571
Yashin, V.E., *See* Sokolova, R.S., 3:45202
Yates, S.W., *See* Ahmad, I., 3:45767
Yavid, V.Y., *See* Pokatilo, Y.M., 3:45061
Yazu, K., *See* Kawabe, T., 3:45892
Yeaple, D.S., *See* Feick, G., 3:45355
Yeh, H.C., *See* Lilly, G.P., 3:44819
Yellin, S.J., *See* Caldwell, D.O., 3:45560
Yellott, J.I., History of solar utilization, 3:44341 (CONF-761220—, pp 3-4)
Yeung, E.S., *See* Chen, K., 3:45489
Yoh, J.K., *See* Fisk, R.J., 3:45575
Yokoyama, M., *See* Thein, A., 3:45932, 3:45941
Yolton, C.F., *See* Froes, F.H., 3:45008
See Williams, J.C., 3:45007
Yoo, M.H., Growth kinetics and 'preference factor' of Frank loops in nickel during electron irradiation, 3:45056
Yoshikawa, S., *See* Itoh, K., 3:45990
Young, G.R., *See* Lazzarini, A.J., 3:45699
Young, H.C., *See* Corum, J.M., 3:45013
Young, J.C., *See* Steinman, D.K., 3:44235
Young, K.C. Jr., *See* Alburger, D.E., 3:45698
Young, M., *See* Anderson, R.T., 3:44275
See Jenkins, P.E., 3:44404
Young, R.T., Laser annealing of diffusion-induced imperfections in silicon, 3:45087
See Narayan, J., 3:44362, 3:45102
Youngdahl, G.A., *See* Cox, C.W., 3:45268
Youngquist, J., Structural feasibility of parallel-laminated veneer crossarms. Forest Service research paper, 3:44627 (AD-A—048278)
Yount, D.E., *See* Jaros, J.A., 3:45561
Yu. A.Shchekinov, *See* Suchkov, A.A., 3:45445
Yu, C.P., *See* Chang, C.M., 3:44465
Yu, J., *See* Buder, M.K., 3:44122
Yu, M.L., Effect of primary ion energy and surface chemistry on the secondary ion yields in low-energy SIMS experiments, 3:45030
Yu, M.Y., *See* Spatschek, K.H., 3:46050
Yu, P.Y., Resonance Raman studies in Cu_2O. II. The yellow and green excitonic series, 3:45092
Yuan, S.W., Long duration earth storage of solar energy, 3:44561 (CONF-761220—, pp 35-39)
Yuen, S.Y., *See* Hutchinson, I.H., 3:45886
Yuferev, V.S., *See* Bulyginskii, D.G., 3:45898
Yuill, G.K., Simplified model for the solar collector: load interaction, 3:44433 (CONF-761220—, pp 319)
Yukov, E.A., *See* Vinogradov, A.V., 3:45928
Yulchiev, A., *See* Arushanov, G.G., 3:45630
Yur'ev, V.G., *See* Baksht, F.G., 3:45926, 3:45927
Yurina. L.V., *See* Biryhkov, Yu.V., 3:44077
Yusa, H., *See* Kamiya, K., 3:44286
Yushchenko, T.A., *See* Zelenskaya, N.S., 3:45799
Yushmanov, P.N., *See* Kovalenko, V.P., 3:46062
See Zhdanov, V.M., 3:45966

Z

Zabeltitz, C. von, Greenhouseheating with sun-energy, 3:44453
Zablotskaya, G.R., *See* Gosteva, T.S., 3:45940
Zaider, M., RBEOER: a FORTRAN program for the computation of RBEs, OERs, survival ratios, and the effects of fractionation using the theory of dual radiation action, 3:45395 (LA—7196-MS)
See Dicello, J.F., 3:45396
Zakharov, L.E., Theory of hydromagnetic stability of a tokamak plasma, 3:46013
Zakharov, V.I., *See* Vainshtein, A.I., 3:45673
Zakhorenkov, Y.A., *See* Bychenkov, V.Y., 3:45918
Zaklad, H., *See* Derenzo, S.E., 3:45389
Zani, D.A., Solar energy collecting device, 3:44513
Zapesochnyi, I.P., *See* Aleksakhin, I.S., 3:45541
Zarubin, P.P., *See* Mihu, R., 3:45744
Zasavitskii, I.I., *See* Girich, B.G., 3:45186
Zauderer, B., *See* Cook, C.S., 3:44900
Zazyan, M.Z., *See* Azaryan, M.O., 3:45579
Zebelman, A.M., *See* Westfall, G.D., 3:45707
Zee, A., *See* Barr, S.M., 3:45596
Zeidman, B., Elastic scattering of 162-MeV pions by nuclei, 3:45700
See Burman, R.L., 3:45697
See Henning, W., 3:45740
Zeigler, R.K., *See* Bement, T.R., 3:44216
Zel'dovich, Y.B., Gravitation, charges, cosmology, and coherence, 3:45472
Zel'manov, A.L., Relativity of space and time finiteness—infiniteness for a matter-filled universe, 3:45470
Zelenskaya, N.S., Description of backward maxima in cross sections with allowance for exchange processes, 3:45799
See Teplov, I.B., 3:45804
Zemke, W.T., Radiative lifetimes for vibrational levels of the $B\ ^1Pi$ state of ^7LiH, 3:45493
Radiative transition probabilities for the $B\ ^1Pi—X\ ^1\Sigma^+$ and $B\ ^1Pi—A\ ^1\Sigma^+$ bands of ^7LiH, 3:45492
Zhabko, T.E., *See* Sirota, N.N., 3:45039
Zharikov, O.V., *See* Vinnikov, L.Y., 3:45049
Zhdanov, V.M., Pfirsch—Schlueter impurity diffusion, 3:45966
Zhdanov, V.P., Charge exchange in plasmas, 3:45978
Zhilinskii, A.P., Measurement of the properties of a weakly ionized plasma with an electrostatic probe in a magnetic field. 1. Charged-particle density, 3:45920
See Voronov, V.M., 3:45921
Zhitnikov, R.A., *See* Dmitriev, S.P., 3:45513
Zhukovskii, V.G., Plasma diagnostic by the "two-beam" method, 3:45924
Zhuravlyov, V.I., *See* Abagjan, A.A., 3:44769, 3:45824
Ziegler, R.C., *See* Leonard, R.P., 3:45300, 3:45301, 3:45364, 3:45365
Ziehm, K.F. Jr., Desalination apparatus, 3:44470
Zielinski, R.A., Uranium—lead apparent ages of uraniferous secondary silica as a guide for describing uranium mobility, 3:44220 (USGS-CIRC—753, pp 39-40)
Zimmerman, R.A., *See* Kuhl, D.E., 3:45392
Ziock, K.O.H., *See* Doering, R., 3:45715
Zisman, M.S., *See* Miller, J.M., 3:45751
See Vandenbosch, R., 3:45734
Zito, R. Jr., Method of operating a fuel cell, 3:44910
Zlotnik, E.Y., Interpretation of the polarized zebra structure in solar radio emission, 3:45461

Zoutendyk, J.A., Theoretical analysis of heat flow in horizontal ribbon growth from a melt, 3:45864
Zubaly, R.B., *See* Lewis, E.V., 3:44953
Zuber, G., Selective separation of technetium, 3:45117 (UCRL-Trans—11365)
Zuhair, *See* Al-Shaieb, 3:44229
Zur Nieden, E., Reflections on working safety in bituminous coal mining, 3:44139
Zurmuehle, R.W., *See* Alburger, D.E., 3:45698
See Wender, S.A., 3:45706
Zvonarev, A.V., *See* Bakumenko, O.D., 3:44700
Zwillinger, D., Radiant energy collector panel and system, 3:44504
Zykov, B.M., Oxidation of the (110) face of a molybdenum single crystal, 3:45032

SUBJECT INDEX

The subject index is based on the use of subject descriptors selected from a controlled thesaurus of terms. Subject descriptors and qualifiers (subheadings) are selected and presented in the following format:

SUBJECT DESCRIPTOR/QUALIFIER
Title, (supplementary information), citation number, (report number)

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

A

A1-1070 RESONANCES/PARTICLE PRODUCTION
Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581

A2-1310 RESONANCES/PARTICLE PRODUCTION
Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581

ABSOLUTE INSTABILITIES/TEMPERATURE GRADIENTS
Threshold for the absolute instability of stimulated Brillouin scattering in a plasma with density and temperature gradients, 3:46072

ABSORPTION REFRIGERATION CYCLE/OPTIMIZATION
Computer simulation and system optimization of a solar powered absorption cooling process, 3:44430 (CONF-761220-)

ACCELERATOR BREEDERS/FEASIBILITY STUDIES
Future of high intensity accelerators in nuclear energy, 3:45246 (AECL-5903)

ACCELERATOR FACILITIES/PRESSURE MEASUREMENT
Pressure measurements in a cryogenic environment, 3:45225

ACCELERATORS
See also PLASMA BETATRONS
STORAGE RINGS

ACCELERATORS/BEAM-PLASMA SYSTEMS
Resistive phase of a high-voltage water spark, 3:45249

ACCRETION (STARS)
See STAR ACCRETION

ACES
See QUARKS

ACETYLENE/PRODUCTION
ARC-coal acetylene process development program. Quarterly technical progress report No. 1, 9 January-31 March 1978, 3:44073 (TID-28423)

ACID CARBONATES/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590

ACID MINE DRAINAGE/BIBLIOGRAPHIES
Coal and coal mine drainage, 3:44087

ACROLEIC ACID
See ACRYLIC ACID

ACRYLIC ACID/CHEMICAL RADIATION EFFECTS
Radiation-induced crosslinking of polyethylene in the presence of bifunctional vinyl monomers, 3:45127 (ORO-2845-T1)

ACRYLONITRILE/CHEMICAL RADIATION EFFECTS
Radiation-induced crosslinking of polyethylene in the presence of bifunctional vinyl monomers, 3:45127 (ORO-2845-T1)

ACTINIDES/SEPARATION PROCESSES
Separation and recycling of actinides: a review of the state of the art, 3:44279 (EUR-5801)

ACTIVATION ANALYSIS/NEUTRON FLUX
Evaluation of the neutron flux-depression factor via the integral transform method, 3:45819

ACTIVATION ANALYSIS/ON-LINE MEASUREMENT SYSTEMS
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)

ADENOSINE/BIOCHEMICAL REACTION KINETICS
Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3':5'-cyclic monophosphate levels in primary cultures of glia (Rat cerebral cortical tissue), 3:45367 (UCLA-12-1145)

ADENOSINE MONOPHOSPHATE
See AMP

ADIABATIC TOROIDAL COMPRESSORS
See ATC DEVICES

ADSORBENTS/REGENERATION
Supportive studies in fluidized-bed combustion. Quarterly report, July-September 1977, 3:44131 (ANL/CEN/FE-77-8)

ADVERSARIES/FORECASTING
Intrusion-detection via adaptive prediction, 3:44311 (SAND-77-1591)

AERIAL PROSPECTING/DATA ANALYSIS
Geostatistics Project of the National Uranium Resource Evaluation Program. Progress report, January-March 1978, 3:44216 (LA-7296-PR)

AEROSOLS
See also RADIOACTIVE AEROSOLS

AEROSOLS/ENVIRONMENTAL TRANSPORT
Relationships between removal processes and residence times for atmospheric pollutants, 3:45290 (CONF-780611-3)

AFTERBURNERS
Electrically induced waste air combustion. Applications and advantages of the new process, 3:45241

AGRICULTURAL WASTES/ANAEROBIC DIGESTION
Prospects of biogasproduction from agricultural organic residues, 3:44333

AGRICULTURAL WASTES/BIOCONVERSION
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)

AGRICULTURAL WASTES/CONVERSION
Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970-1977, 3:44328 (NTIS/PS-78/0054)

AGRICULTURE
See also FARMS
Global environment, 3:45329 (NP-23191)

AGRICULTURE/ENERGY ANALYSIS
Developing an energy input-output simulator (AGNRG) for analysis of alternative cropping systems in the Corn Belt (energy in agriculture), 3:44855 (PB-274094)
Energy-cased analysis of alternative production methods and cropping systems in the Corn belt, 3:44853 (PB-273896)
AGRICULTURE/ENERGY CONSERVATION
Developing an energy input-output simulator (AGNRG) for analysis of a¹ternative cropping systems in the Corn Belt (energy in agriculture), 3:44855 (PB-274094)
Energy-cased analysis of alternative production methods and cropping systems in the Corn belt, 3:44853 (PB-273896)
AGRICULTURE/ENERGY DEMAND
Energy-related impacts on Great Plains agricultural productivity in the next quarter century, 1976-2000. Great plains agricultural council publication, 3:44959 (PB-274136)
AGRICULTURE/GLOBAL ASPECTS
World food problem and U.S. food politics and policies: 1972-1976 (Book; 75 articles), 3:44865
AGRICULTURE/SOLAR ENERGY
Solar technology in agriculture, 3:44459
AIR
See also EARTH ATMOSPHERE
SURFACE AIR
AIR/GLOW DISCHARGES
Ionizational instabilities of an externally sustained discharge in air, 3:46019
AIR/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
AIR/RADIOACTIVITY
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
AIR CONDITIONERS
See also SOLAR AIR CONDITIONERS
AIR CONDITIONERS/DESIGN
Solar air conditioning system (Patent), 3:44446
AIR CONDITIONERS/ENERGY EFFICIENCY
Energy efficiency program for room air conditioners, central air conditioners, dehumidifiers, and heat pumps, 3:44926 (SAI-77-858-LJ)
AIR FILTERS/LEAKS
Performance of a pulse jet filter at high filtration velocity. III. Penetration by fault processes (Effect of by-pass leaks and methods of detection), 3:45240
AIR FILTERS/PERFORMANCE
Performance of a pulse jet filter at high filtration velocity. III. Penetration by fault processes (Effect of by-pass leaks and methods of detection), 3:45240
Supercompact jet filters in cyclone dimensions with optimum single-sleeve rinsing systems set new standards, 3:45237
AIR POLLUTION/BIOLOGICAL EFFECTS
Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis, 3:45422 (PB-274339)
AIR POLLUTION/CARBON DIOXIDE
How much more CO_2 can we take, 3:45305
Role of increasing CO_2 concentrations in the atmosphere, 3:45306
AIR POLLUTION/DATA ACQUISITION
The 1976 NRL air quality data. Final report, 3:45289 (AD-A-048750)
AIR POLLUTION/DIFFUSION
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP-1469)
AIR POLLUTION/ENVIRONMENTAL EFFECTS
Perspectives on the environment, 3:45294 (NP-23191)
AIR POLLUTION/MONITORING
CEQ studies, 3:45296 (NP-23191)
Environmental quality. The sixth annual report of the Council on Environmental Quality, 3:45293 (NP-23191)
Environmental conditions and trends, 3:45295 (NP-23191)
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
Waste gas control in cars as an active contribution to environmental protection, 3:44988
AIR POLLUTION/PHOTOCHEMICAL OXIDANTS
Measurement of rate constants of importance in smog. Final report, April 1973-July 1977, 3:45298 (PB-274530)
AIR POLLUTION/POLLUTION CONTROL
Canadian experience with the reduction of mercury at chlor-alkali plants, 3:45313
AIR POLLUTION/REGIONAL ANALYSIS
National air quality and emissions trends report, 1976, 3:45292 (EPA-450/1-77-002)
AIR POLLUTION CONTROL
Control of volatile organic emissions from solvent metal cleaning, 3:45322 (PB-274557)
AIR POLLUTION CONTROL/GOVERNMENT POLICIES
Environmental quality control - governmental finances: fiscal year 1974-1975. State and local government special studies, 3:45299 (PB-275760)
AIR POLLUTION CONTROL/REGULATIONS
Issuing of guidelines - role and activities of the VDI Kommission Reinhaltung der Luft, 3:45307
AIR POLLUTION CONTROL/STANDARDS
Issuing of guidelines - role and activities of the VDI Kommission Reinhaltung der Luft, 3:45307
Origins, development, and targets of the VDI Kommission Reinhaltung der Luft, 3:45308
AIR POLLUTION MONITORS
Thermocatalytic detection of NO/sub x/, 3:44983
AIR POLLUTION MONITORS/LASERS
Tunable laser spectral survey of molecular air pollutants. Final report, 3:45302 (PB-276188)
AIR QUALITY
CEQ studies, 3:45296 (NP-23191)
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
Perspectives on the environment, 3:45294 (NP-23191)
AIR QUALITY/MONITORING
Environmental conditions and trends, 3:45295 (NP-23191)
AIRCRAFT/FUEL CONSUMPTION
Analysis of fuel conservation through aircraft towing. Technical report, 3:44951 (PB-274586)
ALASKA/COAL MINING
Technical and economic feasibility of surface mining coal deposits, North Slope of Alaska. Final report, 3:44098 (PB-274373)
ALASKA/ELECTRIC POWER
The 1976 Alaska power survey. Volume 2, 3:44893 (PB-274081)
ALASKA/URANIUM DEPOSITS
Uranium and thorium distribution in continental tertiary rocks of the Cook Inlet Basin and some adjacent areas, Alaska, 3:44234 (USGS-CIRC-753)
ALASKA OIL PIPELINE
Alaska oil starts flowing, 3:44188
ALCOHOLS
See also METHANOL
ALCOHOLS/BIOSYNTHESIS
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
ALDRIN/TOXICITY
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
ALFVEN WAVES/DRIFT INSTABILITY
Theory of "drift" thermonuclear instabilities in a tokamak reactor, 3:46014
ALFVEN WAVES/HELICAL INSTABILITY
Nonlinear evolution of drift Alfven and double tearing instabilities, 3:46006
ALFVEN WAVES/INSTABILITY GROWTH RATES
Collapse of Alfven waves, 3:46074
ALFVEN WAVES/SCATTERING
Parametric decay of lower hybrid wave into drift waves, 3:46038 (N-77-33988)
ALFVEN WAVES/STABILIZATION
Suppression of the Alfven instability in a two-component tokamak of noncircular cross section, 3:46060
ALFVEN WAVES/TRAPPED-PARTICLE INSTABILITY
Theory of "drift" thermonuclear instabilities in a tokamak reactor, 3:46014
ALGORITHMS
Development of control algorithms for chemistry systems. Final report, September 1, 1978-September 30, 1977, 3:45109 (UCRL-13826)
ALKALI METALS
See also CESIUM
LITHIUM
POTASSIUM
RUBIDIUM
SODIUM
ALKALI METALS/CATALYTIC EFFECTS
Study of the physicochemical properties of activated coke, 3:44084
ALKANES
See also 2-2-DIMETHYLPROPANE
HEPTANE
HEXANE
METHANE
OCTANE
ALKANES/ALKYLATION
Cooling of recycle hydrocarbon and/or alkylate product in isoparaffin-olefin alkylation (Patent), 3:44163

ALKANES/NUCLEAR MAGNETIC RESONANCE
Coal anion structure and chemistry of coal alkylation. Fourth quarterly progress report, December 1, 1977-February 28, 1978 (Carbon atoms in butyl groups), 3:44074 (COO-4227-4)
ALKANES/SEPARATION PROCESSES
Method for the separation of high-boiling hydrocarbons in normal paraffins and branch-chain hydrocarbons on molecular sieves, 3:44167
ALKENES
See also PROPYLENE
ALKENES/ALKYLATION
Cooling of recycle hydrocarbon and/or alkylate product in isoparaffin-olefin alkylation (Patent), 3:44163
ALLOYS/MICROSTRUCTURE
High resolution and high voltage electron microscopy at the University of California, Berkeley, 3:45010 (LBL-6998)
ALLOY-TZM/PHYSICAL RADIATION EFFECTS
Surface damage of molybdenum and TZM alloy under D^+ impact, 3:45060
ALLUVIAL DEPOSITS/RADIONUCLIDE MIGRATION
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
ALLYL RADICALS/CHEMICAL REACTION KINETICS
Radiation chemistry of polyethylene. XIV. Allyl radical decay kinetics in different types of polyethylene (γ rays), 3:45125
ALPHA REACTIONS/COMPOUND-NUCLEUS REACTIONS
Lifetime and γ decay of the isomeric 19/2$^-$ state in ^{43}Ti, 3:45722
Relativistic two-fluid model of nucleus-nucleus collisions, 3:45762
ALPHA REACTIONS/ELASTIC SCATTERING
Description of backward maxima in cross sections with allowance for exchange processes, 3:45799
ALPHA REACTIONS/FISSION
Fission-evaporation competition in Pu isotopes of mass 235-239, 3:45763
Statistical-model analysis of fission isomer production for /sup 237,235/Pu and ^{2}39Am, 3:45764
ALPHA REACTIONS/FRAGMENTATION
Central collisions produced by relativistic heavy ions in nuclear emulsion, 3:45572
Correlated energy spectra of light fragments from 720-MeV α-induced reactions, 3:45715
Fragmentation of ^{4}He, ^{12}C, ^{14}N, and ^{16}O nuclei in nuclear emulsion at 2.1 GeV/nucleon, 3:45688
ALPHA REACTIONS/INELASTIC SCATTERING
^{192}Pt(α,α') reaction at E = 24 MeV, 3:45755
Extension of core polarization in inelastic scattering to include charge-exchange reactions, 3:45792
ALPHA REACTIONS/NUCLEAR REACTION KINETICS
Backward peaks of the cross section in nuclear reactions and exchange processes (> or = 15 MeV), 3:45804
ALPHA REACTIONS/PRECOMPOUND-NUCLEUS EMISSION
Fission-evaporation competition in Pu isotopes of mass 235-239, 3:45763
ALPHA REACTIONS/STRIPPING
Proton states in the Z = 99 nucleus ^{251}Es excited by ^{251}Fm electron capture decay and ^{250}Cf(α,t) reaction, 3:45767
ALPHA REACTIONS/THREE-NUCLEON TRANSFER REACTIONS
Mass and low-lying levels of ^{67}Ge; trends in the structure of /sup 63,65/Ni, /sup 65,67/Zn, and /sup 67,69/Ge, 3:45732
ALPHA SOURCES/RADIATION MONITORING
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
ALPS/GEOPHYSICAL SURVEYS
Geothermal energy and the lithosphere in the south-west of FRG/ Switzerland, 3:44585
ALUMINIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
ALUMINIUM/DEPOSITION
Rate and pressure dependence of contaminants in vacuum-deposited aluminum films, 3:45005
ALUMINIUM/ION-ATOM COLLISIONS
Nonstatistical population of magnetic substates of the $(1s^{-1}2p^{-1})$ $^{1}P_1$ state in Al, 3:45532
ALUMINIUM/SHOCK WAVES
Studies of laser-driven shock waves in aluminum, 3:45981
ALUMINIUM/YIELD STRENGTH
Self-consistent technique for estimating the dynamic yield strength of a shock-loaded material, 3:45017
ALUMINIUM 27/RANGE
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
ALUMINIUM 27/STOPPING POWER
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
ALUMINIUM 27 TARGET/ALPHA REACTIONS
Correlated energy spectra of light fragments from 720-MeV α-induced reactions, 3:45715
ALUMINIUM 27 TARGET/NEUTRON REACTIONS
Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
ALUMINIUM 27 TARGET/OXYGEN 16 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
ALUMINIUM 27 TARGET/PHOTONUCLEAR REACTIONS
Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV, 3:45563
ALUMINIUM 27 TARGET/PROTON REACTIONS
Energy spectra of nuclear fragments produced by high energy protons, 3:45707
ALUMINIUM ALLOYS/CORROSION RESISTANCE
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June-31 August 1977, 3:45053 (FE-2299-15)
ALUMINIUM ALLOYS/FABRICATION
Production of aluminum-silicon alloy and ferrosilicon and commercial purity aluminum by the direct reduction process. First quarterly progress report, 1 September 1977-30 November 1977, 3:45003 (TID-28260)
ALUMINIUM ALLOYS/FORGING
Investigation of separation-lubrication substances for use in isothermal forging. Final report, 16 December 1974-1 July 1976 (Ti-6Al-4V, 1300F to 1800F), 3:45002 (AD-A-048588)
ALUMINIUM ALLOYS/FRACTURE PROPERTIES
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
ALUMINIUM ALLOYS/HOT PRESSING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
ALUMINIUM ALLOYS/HYPERFINE STRUCTURE
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
ALUMINIUM ALLOYS/ISOMER SHIFT
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
ALUMINIUM ALLOYS/WELDING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
ALUMINIUM OXIDES/CREEP
Impurity effects on the creep of polycrystalline magnesium and aluminum oxides at elevated temperatures. Technical progress report, December 19, 1976-December 18, 1977, 3:45065 (COO-1591-32)
ALUMINIUM OXIDES/ELECTRIC CONDUCTIVITY
Electrical properties of Al_2O_3 under isentropic compression up to 500 GPa (5 Mbar), 3:45089
ALUMINIUM OXIDES/F CENTERS
Additive coloration of sapphire, 3:45086
ALUMINIUM OXIDES/LEACHING
Chemical durability of glasses suitable for the storage of high level radioactive wastes. I. On the mechanism of dissolution of the glasses of borax-alumina-silica system in water (Borax-alumina-silica), 3:44300 (ORNL-tr-4626)
ALUMINIUM OXIDES/PHYSICAL RADIATION EFFECTS
Volume expansion and annealing compaction of ion-bombarded single-crystal and polycrystalline α-Al_2O_3, 3:45104
ALUMINIUM OXIDES/RADIATION SCATTERING ANALYSIS
Reduction in the error of determining the ash content of coal by the radioisotope method, 3:44081
ALUMINIUM OXIDES/STABILITY
Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system (SiO_2-B_2O_3-Na_2O-CaO-Al_2O_3-Fe_2O_3), 3:44299 (ORNL-tr-4632)
AMERICIUM 239/FISSION BARRIER
Statistical-model analysis of fission isomer production for /sup 237,235/Pu and ^{2}39Am, 3:45764
AMERICIUM 241/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))

AMMONIA/BIOLOGICAL REGENERATION
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)
AMP
(Adenosine monophosphate.)
AMP/BIOCHEMICAL REACTION KINETICS
Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3':5'-cyclic monophosphate levels in primary cultures of glia (Rat cerebral cortical tissue), 3:45367 (UCLA-12-1145)
AMYLUM
See STARCH
ANDESITES/FRACTURING
Rock drilling and crushing methods: congealing crush of hot dry rock, 3:44595 (CONF-770754-1)
ANGIOGRAPHY
See BIOMEDICAL RADIOGRAPHY
ANIMAL CELLS/BIOLOGICAL RADIATION EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
ANIMAL SHELTERS/SOLAR SPACE HEATING
Solar technology in agriculture, 3:44459
ANIMALS
(See also specific animal names.)
See also AQUATIC ORGANISMS
DOMESTIC ANIMALS
INVERTEBRATES
WILD ANIMALS
ANIMALS/POLLUTION
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
ANNELIDS
Importance of sediment working by the deposit-feeding polychaete Arenicola marina on the weathering rate of sediment-bound oil, 3:45413
ANTHRACENE/HYDROGENATION
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
ANTHRACITE/MICROHARDNESS
Question of the accuracy of the determination of the microhardness of anthracites, 3:44079
ANTIMONY/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
ANTIMONY/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
ANTIMONY ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
ANTINEUTRINO-NUCLEON INTERACTIONS/CHARGED-CURRENT INTERACTIONS
Experimental mean y values and intergrated structure functions for neutrino and antineutrino scattering at high energy, 3:45566
ANTINEUTRINO-NUCLEON INTERACTIONS/DEEP INELASTIC SCATTERING
Experimental mean y values and intergrated structure functions for neutrino and antineutrino scattering at high energy, 3:45566
ANTIREFLECTION COATINGS/DEPOSITION
Anti-reflective coating for silicon solar cells (Patent), 3:44372
AORTA/INJURIES
Feasibility of investigating the mechanisms of aortic trauma using high-speed cineradiography. A pilot study. Final report, 15 May-31 August 1977, 3:45386 (PB-275632)
AORTA/PATHOLOGICAL CHANGES
Feasibility of investigating the mechanisms of aortic trauma using high-speed cineradiography. A pilot study. Final report, 15 May-31 August 1977, 3:45386 (PB-275632)
APARTMENT BUILDINGS/SOLAR HEATING SYSTEMS
Technical economical study of the solar house situated in Cuarte De Huerva (Zaragoza), 3:44409 (CONF-761220-)
APARTMENT BUILDINGS/SOLAR SPACE HEATING
Solar energy for the hotel/motel industry, 3:44414 (CONF-761220-)
APARTMENT BUILDINGS/SOLAR WATER HEATING
Solar energy for the hotel/motel industry, 3:44414 (CONF-761220-)
Technical economical study of the solar house situated in Cuarte De Huerva (Zaragoza), 3:44409 (CONF-761220-)
APPALACHIA/AIR POLLUTION
Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB-274107)
APPALACHIA/LAND RECLAMATION
Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB-274107)
APPALACHIA/MINERAL RESOURCES
Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB-274107)
APPALACHIA/URANIUM DEPOSITS
Two-mica granite and uranium potential in the northern Appalachian orogen of New England, 3:44246 (USGS-CIRC-753)
APPALACHIA/WATER POLLUTION
Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB-274107)
APPARATUS
See EQUIPMENT
AQUATIC ECOSYSTEMS/MEETINGS
Heavy metals in the aquatic environment, 3:45338
AQUATIC ECOSYSTEMS/MINERAL CYCLING
Relationship between content of copper in fish, plankton, and lake water, 3:45337 (UCRL-Trans-11369)
AQUATIC ECOSYSTEMS/POLLUTION
Biological and nonbiological transformations of mercury in aquatic systems, 3:45347
Feasibility of restoring mercury-contaminated waters, 3:45353
AQUATIC ECOSYSTEMS/WATER POLLUTION
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID-17744-78-2)
Heavy metals in the aquatic environment, 3:45338
AQUATIC ORGANISMS
(Unspecified biota characteristic of aquatic ecosystems.)
See also CRUSTACEANS
FISHES
MOLLUSCS
PLANKTON
Long-term effects of an oil spill on Fucus macrofauna in a small Baltic bay, 3:44183
Physiological stresses and response in chronically oiled organisms, 3:45417
AQUATIC ORGANISMS/POLLUTION
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
AQUATIC ORGANISMS/SURVIVAL TIME
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID-17744-78-2)
AQUATIC ORGANISMS/THERMAL POLLUTION
Thermal effects on aquatic organisms: an annotated bibliography of the 1976 literature, 3:45406 (ORNL/EIS-124)
ARAMIDS/CRYSTAL STRUCTURE
Fiber composite technology, 3:45079 (UCRL-50019-77-1)
ARAMIDS/PHYSICAL PROPERTIES
Fiber composite technology, 3:45079 (UCRL-50019-77-1)
ARCHITECTURE
Significance of hybrid solar architecture, 3:44406 (CONF-761220-)
ARCHITECTURE/SOCIO-ECONOMIC FACTORS
Solar aesthetics and incentives, 3:44401 (CONF-761220-)
ARCTIC REGIONS
Prudhoe crude oil in Arctic marine ice, water, and sediment ecosystems: degradation and interactions with microbial and benthic communities, 3:44176
ARDENNES REACTOR/PRIMARY COOLANT CIRCUITS
Analysis of dose rates near the circuit of a PWR after shutdown, 3:44655
ARGON/ATOM-ATOM COLLISIONS
Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H, 3:45525
ARGON/ATOM-MOLECULE COLLISIONS
Collision-induced ion-pair formation of CsCl and Cs_2Cl_2, 3:45526
ARGON/DIMERS
Photoelectron spectra of Ar_2 and Kr_2 and dissociation energies of the rare gas dimer ions, 3:45490
ARGON/DISSOCIATION ENERGY
Photoelectron spectra of Ar_2 and Kr_2 and dissociation energies of the rare gas dimer ions, 3:45490
ARGON/ELECTRON-ATOM COLLISIONS
Bremsstrahlung in collisions of fast electrons with atoms, 3:45538
ARGON/ION-ATOM COLLISIONS
Z, velocity, and charge dependence of zero-degree electron "cusps" from charge transfer to continuum states of bare and highly ionized projectiles, 3:45534

ARGON/MOLECULES
Calculation of the photoionization cross section of the $^{1}\Sigma$/sub u/$^{+}$ excimer state of Ar_2, 3:45496
ARGON/PHOTOIONIZATION
Calculation of the photoionization cross section of the $^{1}\Sigma$/sub u/$^{+}$ excimer state of Ar_2, 3:45496
ARGON/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
ARGON 40/RANGE
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
ARGON 40/STOPPING POWER
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
ARGON 40 REACTIONS/BACKSCATTERING
Recoil-distance measurement of lifetimes of rotational states in ^{1}64Dy, 3:45750
ARGON 40 REACTIONS/COULOMB SCATTERING
Coulomb-nuclear interference for high-spin states excited by ^{8}6Kr, ^{4}0Ar, and ^{1}6O projectiles, 3:45748
ARGON 40 REACTIONS/FRAGMENTATION
Central collisions produced by relativistic heavy ions in nuclear emulsion, 3:45572
ARGON 40 REACTIONS/FUSION REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
ARGON 40 REACTIONS/SPALLATION
Spallation of copper by 80-GeV ^{4}0Ar Ions, 3:45733
ARGON 46/ENERGY LEVELS
Nuclear data sheets for A=46, 3:45723
ARGON 46/ENERGY-LEVEL TRANSITIONS
Nuclear data sheets for A=46, 3:45723
ARGON FLUORIDES/ELECTRONIC STRUCTURE
Covalent and ionic states of the rare gas monofluorides, 3:45174
ARGONNE HEAVY WATER REACTOR
See CP-3 REACTOR
ARIZONA/URANIUM DEPOSITS
Geology of uraniferous tertiary rocks in the Artillery Peak-Date Creek basin, west-central Arizona, 3:44218 (USGS-CIRC-753)
AROMATICS
See also DDT
STYRENE
AROMATICS/ENVIRONMENTAL EFFECTS
Distribution of mercury in fish and its form of occurrence, 3:45348
AROMATICS/HYDROGENATION
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
ARSENIC/BIOLOGICAL EFFECTS
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
ARSENIC/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
ARSENIC/MAXIMUM PERMISSIBLE CONCENTRATION
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
ARSENIC/PRECIPITATION
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
ARSENIC/REMOVAL
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
ARSENIC 69/ENERGY-LEVEL TRANSITIONS
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
ARSENIC 69/HIGH SPIN STATES
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
ARSENIC FLUORIDES/ORDER-DISORDER TRANSFORMATIONS
One-dimensional fluctuations and the chain-ordering transformation in Hg/sub 3-delta/AsF_6, 3:45081
ASHES
See also FLY ASH
ASHES/REMOVAL
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
ASPHALTS/PRODUCTION
Use of the dryer drum. Preprint 2843, 3:44957 (CONF-770448-2)
ASTATINE 199/NUCLEAR STRUCTURE
Nuclear Data Sheets for A=199, 3:45756
ASTATINE 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
ASTROCYTOMAS
See NEOPLASMS
ASTRON/STABILITY
Astron stability against poloidal perturbations, 3:45878
ATC DEVICES/ELECTRON DENSITY
Free-expansion experiment on ATC, 3:45937
ATC DEVICES/ION DENSITY
Free-expansion experiment on ATC, 3:45937
ATC DEVICES/LIGHT SCATTERING
Doppler model for adiabatic toroidal compressor driftwave frequency profiles, 3:46045
ATLANTIC OCEAN
See also CHESAPEAKE BAY
ATLANTIC OCEAN/CONTINENTAL SHELF
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
ATLANTIC OCEAN/OCEANOGRAPHY
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
ATMOSPHERIC PRECIPITATIONS
See also SNOW
ATMOSPHERIC PRECIPITATIONS/RADIOACTIVITY
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
ATOM-ATOM COLLISIONS/ELECTROMAGNETIC FIELDS
Radiative collision-induced photoionization, 3:45533
ATOM-ATOM COLLISIONS/ENERGY-LEVEL TRANSITIONS
Theoretical method for solving a two-level collision system, 3:45530
ATOM-ATOM COLLISIONS/INTERATOMIC FORCES
Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H, 3:45525
ATOM-ATOM COLLISIONS/IONIZATION
Photon and positive ion production from collisions of superthermal hydrogen atoms with lithium atoms and molecules, 3:45523
ATOM-ATOM COLLISIONS/PHOTOIONIZATION
Radiative collision-induced photoionization, 3:45533
ATOMIC BOMBS
See NUCLEAR WEAPONS
ATOMIC EXPLOSIONS
See NUCLEAR EXPLOSIONS
ATOMIC WEAPONS
See NUCLEAR WEAPONS
ATOMS
See also MUONIC ATOMS
ATOMS/EXCITATION
Coherence vs. incoherence in stepwise laser excitation, 3:45862
Effects of magnetic sublevel degeneracy on Rabi oscillations, 3:45547
ATOMS/P INVARIANCE
Parity violation in atoms induced by radiative corrections, 3:45614
AURORAE/RADIOWAVE RADIATION
Electromagnetic plasma wave emissions from the auroral field lines, 3:45483 (N-77-33387)
AURORAL HISS
Electromagnetic plasma wave emissions from the auroral field lines, 3:45483 (N-77-33387)
AUSTRIA/NATURAL GAS INDUSTRY
Oil industry in Austria during 1976, 3:44174
AUSTRIA/PETROLEUM INDUSTRY
Oil industry in Austria during 1976, 3:44174
AUTOMOBILE EXHAUST REACTORS
See AFTERBURNERS
AUTOMOBILE INDUSTRY/FINANCING
Disaggregated financial data and analysis for the domestic motor vehicle manufacturers. Technical report, 3:44857 (PB-275826)
AUTOMOBILES/EXHAUST GASES
Thermocatalytic detection of NO/sub x/, 3:44983
AUTOMOBILES/FLYWHEELS
Flywheel energy storage systems for road vehicles. Tests with glass-fibre compound constructions, 3:44972
Study of heat engine/flywheel: hybrid propulsion configuration with electrical transmission system, Phase II, final report. Design definition, 3:44971 (ALO-41/2)
AUTOMOBILES/FUEL ECONOMY
Fuel economy of automotive vehicles: a compendium of statistical techniques, 3:44952 (HCP/M6037-01)
AUTOMOBILES/HYBRID SYSTEMS
Study of heat engine/flywheel: hybrid propulsion configuration with electrical transmission system, Phase II, final report. Design definition, 3:44971 (ALO-41/2)

AUTOMOBILES/SPARK IGNITION ENGINES
Variable-displacement spark-ignition engine. Final report, 3:44973 (SAND-77-8299)
AUTOMOTIVE FUELS/PRODUCTION
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
AUTOMOTIVE FUELS/TECHNOLOGY ASSESSMENT
Compendium of critiques of JPL report SP-43-17: automotive technology status and projections project, 3:44969 (N-77-33519)
AUTORADIOGRAPHS
See IMAGES
AXONS
See NERVE CELLS

B

B-1235 RESONANCES/PARTICLE PRODUCTION
Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581
BACKGROUND RADIATION/FLUCTUATIONS
Fluctuations in the primordial background radiation induced by secondary ionization of matter in the universe, 3:45469
BACTERIA/DISTRIBUTION
Distribution and abundance of hydrocarbon-utilizing bacteria in sediments of Chedabucto Bay, Nova Scotia, in 1976, 3:45408
BAG MODEL/EXCITED STATES
Radial excitations of hadronic bags, 3:45627
BALL BEARINGS
Effects of various treatments on the serviceability of water-immersed carbon-steel ball bearings (for CANDU type reactor fuelling machines), 3:44668 (AECL-5823)
BALL BEARINGS/MECHANICAL TESTS
Testing of unlubricated water-immersed carbon-steel ball bearings (CANDU reactor fuelling machines), 3:44669 (AECL-5824)
BARIUM/ABSORPTION SPECTRA
Atomic diamagnetism: Quasi Landau spectrum near the ionization threshold, 3:45509
BARIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
BARIUM/ELECTRON-ATOM COLLISIONS
Electronic spectra of autoionization states of barium, observed in electron-atom collisions, 3:45541
Investigation of the Ba emission spectra in the 50-90-nm region with electron impact excitation of atoms, 3:45540
BARIUM/IONIZATION
Atomic diamagnetism: Quasi Landau spectrum near the ionization threshold, 3:45509
BARIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
BATTERIES (ELECTRIC)
See ELECTRIC BATTERIES
BEAM INJECTION HEATING
Injection of electron beams into mirror confined plasmas (I), 3:45892 (UCRL-Trans-11356)
JFT-2 tokamak neutral injector and preliminary results of additional heating experiment, 3:46102 (JAERI-M-7043)
BEAM OPTICS/BEAM NEUTRALIZATION
Mitigation of residual space charge ion optics effects in gas cell by adjustment of beam perveance, 3:45501
BEAM-PLASMA SYSTEMS
Intense focussed ion beams and their interaction with matter. Interim report, 3:45933 (AD-A-048753)
BEAM-PLASMA SYSTEMS/ELECTRIC CURRENTS
Return-current amplification in the interaction of an intense relativistic electron beam with a gas target, 3:45940
BEAM-PLASMA SYSTEMS/ELECTRON DENSITY
Electron density and electron temperature in a neon plasma generated by 20-MeV protons, 3:45982
BEAM-PLASMA SYSTEMS/ELECTRON TEMPERATURE
Electron density and electron temperature in a neon plasma generated by 20-MeV protons, 3:45982
BEAM-PLASMA SYSTEMS/ENERGY SPECTRA
Scattering and energy broadening of an electron beam in a plasma, 3:45943
BEAM-PLASMA SYSTEMS/EQUILIBRIUM
Equilibrium of REB-ring with soft-core, 3:45945 (N-77-33978)
BEAM-PLASMA SYSTEMS/EXPLOSIVE INSTABILITY
Computation of two-stream explosive instability including harmonics generation and distribution function evolution, 3:46007
BEAM-PLASMA SYSTEMS/HOSE INSTABILITY
Measurements of hose instability of a relativistic electron beam, 3:45993
Resistive hose instability of a beam with the Bennett profile, 3:45992
BEAM-PLASMA SYSTEMS/IONIZATION
Beam-plasma discharge in crossed electric and magnetic fields, 3:45983
BEAM-PLASMA SYSTEMS/NONLINEAR PROBLEMS
Nonlinear charge-density waves in a bounded magnetized plasma, 3:46063
Steady-State nonlinear waves in a plasma with a modulated electron beam, 3:46062
BEAM-PLASMA SYSTEMS/PLASMA HEATING
Experiments with a relativistic electron beam injected into a plasma, 3:45900
Neutral-beam divergence due to imperfect magnetic shielding, 3:45880
BEAM-PLASMA SYSTEMS/PLASMA INSTABILITY
Effects of low frequency plasma waves on counter-streaming electron beam instability, 3:46029
Instability of the Trivelpiece mode in a magnetized beam-plasma system, 3:46032
BEAM-PLASMA SYSTEMS/PLASMA MACROINSTABILITIES
Global instability of a nonequilibrium plasma slab, 3:46020
BEAM-PLASMA SYSTEMS/PLASMA SIMULATION
Nonuniform mesh diode simulation code, 3:45980
BEAM-PLASMA SYSTEMS/PLASMA WAVES
Effect of an electron beam on pump-driven quasi-modes, 3:46049
BEAM-PLASMA SYSTEMS/QUASILINEAR PROBLEMS
Quasilinear relaxation of a beam interacting with an isotropic plasma, 3:45977
BEAM-PLASMA SYSTEMS/SCATTERING
Scattering and energy broadening of an electron beam in a plasma, 3:45943
BEAM-PLASMA SYSTEMS/SOLITONS
Nonlinear charge-density waves in a bounded magnetized plasma, 3:46063
BEAM-PLASMA SYSTEMS/TWO-STREAM INSTABILITY
Computation of two-stream explosive instability including harmonics generation and distribution function evolution, 3:46007
Theory of electromagnetic instabilities in an inhomogeneous plasma stream with an anisotropic pressure, 3:46023
BELGIUM/NUCLEAR POWER PLANTS
Different reactor types and the Belgian option, 3:44722
BELT PINCH/MAGNETIC FIELD CONFIGURATIONS
Numerical computation of high-beta toroidal diffuse equilibria, 3:46100
BELT PINCH/MAGNETOHYDRODYNAMICS
Modelling of MHD equilibria of the Garching Belt Pinches by a cylindrical slab, 3:45958
BELT PINCH/MATHEMATICAL MODELS
Modelling of MHD equilibria of the Garching Belt Pinches by a cylindrical slab, 3:45958
BENTHOS/RECOVERY
Recovery of benthic macrofauna from chronic pollution in the sea area off a refinery plant, southwest Finland, 3:45418
BENTONITE/RADIONUCLIDE MIGRATION
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
BER-2 REACTOR/EXPERIMENTAL CHANNELS
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
BERLIN-2 RESEARCH REACTOR
See BER-2 REACTOR
BERNSTEIN MODE/PLASMA SIMULATION
Simulation study of Bernstein modes, 3:46044
BERYLLIUM/THERMOELECTRIC PROPERTIES
Quantum oscillations of thermoelectric power under magnetic breakdown conditions, 3:45052
BERYLLIUM 10 TARGET/TRITON REACTIONS
Core excited T = 2 levels in A = 12 from studies of ^{12}Be, 3:45698
BERYLLIUM 11/ENERGY LEVELS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
BERYLLIUM 12/BETA-MINUS DECAY
Core excited T = 2 levels in A = 12 from studies of ^{12}Be, 3:45698
BERYLLIUM 12/EXCITED STATES
Core excited T = 2 levels in A = 12 from studies of ^{12}Be, 3:45698

BERYLLIUM 9 REACTIONS/COMPOUND-NUCLEUS REACTIONS
Multiple high-spin band structure in ^{164}Er, 3:45749
BERYLLIUM 9 REACTIONS/FUSION REACTIONS
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
BERYLLIUM 9 TARGET/ELECTRON REACTIONS
Quasielastic scattering of electrons by ^{6}Li, ^{7}Li, and ^{9}Be and the final-state interaction, 3:45709
BERYLLIUM 9 TARGET/NEUTRON REACTIONS
Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
BERYLLIUM 9 TARGET/PION MINUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
Production of J/Psi particles by 43-GeV/c π^- mesons on the nuclei Be, Cu, and W, 3:45586
BERYLLIUM 9 TARGET/PION PLUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
BERYLLIUM 9 TARGET/PROTON REACTIONS
Correlations between two hadrons at large transverse momenta, 3:45575
BERYLLIUM 9 TARGET/TRITON REACTIONS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
BERYLLIUM MODERATORS
See BERYLLIUM
BETA SOURCES/RADIATION MONITORING
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
BETHE-WEIZSAECKER RELATION
See WEIZSAECKER FORMULA
BICARBONATES
See ACID CARBONATES
BIOCONVERSION/REVIEWS
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
BIOLOGICAL MATERIALS
(See also specific biological materials.)
See also BIOMASS
FOOD
MILK
ORGANS
PLANTS
BIOLOGICAL MATERIALS/ACTIVATION ANALYSIS
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
BIOLOGICAL MATERIALS/BIOLOGICAL RADIATION EFFECTS
RBEOER: a FORTRAN program for the computation of RBEs, OERs, survival ratios, and the effects of fractionation using the theory of dual radiation action, 3:45395 (LA-7196-MS)
BIOLOGICAL RADIATION EFFECTS/BIBLIOGRAPHIES
Biological effects of laser radiation (a bibliography with abstracts). Report for 1964-January 1978, 3:45397 (NTIS/PS-78/0036)
BIOLOGICAL RADIATION EFFECTS/DOSE-RESPONSE RELATIONSHIPS
RBEOER: a FORTRAN program for the computation of RBEs, OERs, survival ratios, and the effects of fractionation using the theory of dual radiation action, 3:45395 (LA-7196-MS)
BIOLOGICAL SHIELDING/FABRICATION
Fresh concrete control in situ of biological shields of nuclear reactors, 3:44768
BIOMASS
(All growing organic matter such as plants, trees, grasses, and algae.)
See also PLANTS
BIOMASS/ANAEROBIC DIGESTION
Technology of putrefraction of organic material for production of methane, 3:44334
BIOMASS/COMBUSTION
Producing energy from straw and wood waste, 3:44339
BIOMASS PLANTATIONS
Utilization of solar energy through photosynthesis and artificial water photolysis, 3:44389
BIOMEDICAL RADIOGRAPHY/TOMOGRAPHY
Reconstruction tomography in diagnostic radiology and nuclear medicine (Book), 3:45382
BIRDS/BEHAVIOR
Fatal flights of birds against windows, 3:45366 (ORNL-tr-4618)
BIRDS/CLEANING
Oiled seabird rescue and conservation, 3:44179
BIRDS/MORTALITY
Fatal flights of birds against windows, 3:45366 (ORNL-tr-4618)
BISMUTH/CRITICAL FIELD
Critical magnetic fields of ultrathin bismuth films, 3:45045
BISMUTH 199/ENERGY LEVELS
Nuclear Data Sheets for A=199, 3:45756
BISMUTH 199/NUCLEAR STRUCTURE
Nuclear Data Sheets for A=199, 3:45756
BISMUTH 203/ENERGY LEVELS
Nuclear data sheets for A=203, 3:45757
BISMUTH 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
BISMUTH 209/PARITY
Possible suppression of P-odd effects in heavy atoms, 3:45516
BISMUTH SULFATES/DECOMPOSITION
Thermochemical processes for hydrogen production. Progress report, August 1, 1977-February 28, 1978, 3:44327 (LA-7234-PR)
BITTER SPAR
See DOLOMITE
BITUMINOUS COAL/CARBONIZATION
Equipment to carbonize fine-grained fuels (Patent), 3:44026
BITUMINOUS COAL/COKING
Present state of coking technology and development trends, 3:44024
Research and development as an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. Quarterly report, September-November 1977 (Tracer studies), 3:44060 (FE-1800-21)
BLACK COATINGS/ABSORPTIVITY
New black chrome selective absorbing surface, 3:44483 (CONF-761220-)
BLACK COATINGS/ELECTRODEPOSITION
Method of producing coatings having a high absorption in the range of the solar spectrum (Patent), 3:44507
BLACK COATINGS/REFLECTIVITY
New black chrome selective absorbing surface, 3:44483 (CONF-761220-)
BLACK HOLES/EVAPORATION
Gravitation, charges, cosmology, and coherence, 3:45472
BLACK SHALES/CHEMICAL COMPOSITION
Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October-December 1977, 3:44203 (FE-2346-20)
BLACK SHALES/HYDRAULIC FRACTURING
Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October-December 1977, 3:44203 (FE-2346-20)
BLACK SHALES/IN-SITU COMBUSTION
Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October-December 1977, 3:44203 (FE-2346-20)
BLACK SHALES/MECHANICAL PROPERTIES
Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October-December 1977, 3:44203 (FE-2346-20)
BLANKETS (BREEDING)
See BREEDING BLANKETS
BLASTS
See EXPLOSIONS
BLOOD FLOW/MEASURING METHODS
Computerized emission transaxial tomography and determination of local brain function, 3:45392
BLOOD FLOW/REGIONAL ANALYSIS
Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer-assisted CNS studies, 3:45393
BLOWOUTS
Preliminary assessment of the presence of oil in the ecosystem at Ekofisk after the blowout, April 22-30, 1977, 3:44178
BN-350 REACTOR/SHIELDING
BN-350 reactor shielding studies, 3:44700
BOILERS/EFFICIENCY
Gas-heated boiler plants with an efficiency of more than 100%, 3:45233
BOILERS/FOULING
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
BOILERS/SOLAR HEATING
Solar heater (Patent), 3:44547
Solar steam boiler (Patent), 3:44519
BOILING WATER REACTORS
See BWR TYPE REACTORS
BORAX/LEACHING
Chemical durability of glasses suitable for the storage of high level radioactive wastes. I. On the mechanism of dissolution of the glasses of borax-alumina-silica system in water (Borax-alumina-silica), 3:44300 (ORNL-tr-4626)
BOREHOLES/INSPECTION
Optical inspection of small-diameter deep bores using rod optics with low-light television and still photography (For corrosion), 3:45224 (UCRL-52431)

BOREHOLES/MEASURING INSTRUMENTS
Formation temperature gauge feasibility study. Volume II (Neutron radiometric gauge), 3:44584 (SAN-0936P48-1)
BOREHOLES/NEUTRON-NEUTRON LOGGING
^{252}Cf-based borehole logging system for in-situ assaying of uranium ore, 3:44235 (USGS-CIRC-753)
BOREHOLES/RESISTIVITY LOGGING
Role of borehole electrical measurements in uranium exploration, 3:44244 (USGS-CIRC-753)
BOREHOLES/THERMAL INSULATION
Method and device for the thermal insulation of a deep well, 3:44157
BORON/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
BORON 10 TARGET/TRITON REACTIONS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
BORON 11 REACTIONS/COMPOUND-NUCLEUS REACTIONS
Mass and β decay of the new isotope ^{57}Cr, 3:45721
BORON 11 REACTIONS/FUSION REACTIONS
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
BORON 11 TARGET/TRITON REACTIONS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
BORON 12/ENERGY LEVELS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
BORON 13/ENERGY LEVELS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
BORON CARBIDES/TENSILE PROPERTIES
Weibull characterization for tensile fracture of multicomponent brittle fibers, 3:45067 (N-77-33929)
BORON OXIDES/STABILITY
Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system (SiO_2-B_2O_3-Na_2O-CaO-Al_2O_3-Fe_2O_3), 3:44299 (ORNL-tr-4632)
BOROSILICATES/RADIATION EFFECTS
Effect of internal alpha radiation on borosilicate glass containing Savannah River Plant waste, 3:44290 (DP-1482)
BRAIN/BIOCHEMISTRY
Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3':5'-cyclic monophosphate levels in primary cultures of glia (Rat cerebral cortical tissue), 3:45367 (UCLA-12-1145)
BRAIN/BLOOD FLOW
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
BRAIN/PHOTON TRANSMISSION SCANNING
Noninvasive brain imaging: computed tomography and radionuclides (Book), 3:45384
BRAIN/RADIOISOTOPE SCANNING
Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer-assisted CNS studies, 3:45393
Noninvasive brain imaging: computed tomography and radionuclides (Book), 3:45384
BRAIN/SCINTISCANNING
Radionuclide computerized tomography for brain study, 3:45388
BRASIMONE PEC REACTOR
See PEC BRASIMONE REACTOR
BRAYTON CYCLE/CONVECTION
Convection in the closed Brayton cycle. Annual summary report No. 3, 1 April 1976-31 March 1977, 3:45242 (AD-A-047262)
BRAZIL/ECONOMIC DEVELOPMENT
Relation between energy - ecology - economy. An investigation with examples from Brazil and other Third World countries, 3:44858
BREAD/POLLUTION
Review of dose-response relationships resulting from human exposure to methylmercury compounds, 3:45423
BREEDER REACTORS
See also ACCELERATOR BREEDERS
GCFR TYPE REACTORS
LMFBR TYPE REACTORS
LWBR TYPE REACTORS
BREEDER REACTORS/SPENT FUEL ELEMENTS
Parametric evaluation of heat transfer and coolant options for breeder reactor spent fuel shipping casks designs, 3:45153 (SAND-77-1415C)
BREEDING BLANKETS/BREEDING RATIO
Calculation of the influence of a thermal shield on the neutron flux and on the tritium production in a fusion reactor blanket, 3:46090 (HMI-B-235)
BREEDING BLANKETS/DESIGN
Radial blanket design and development quarterly progress report for period ending November 30, 1977 (LMFBR), 3:44699 (WARD-RB-3045-22)
BREEDING BLANKETS/PERFORMANCE TESTING
Radial blanket design and development quarterly progress report for period ending November 30, 1977 (LMFBR), 3:44699 (WARD-RB-3045-22)
BREMSSTRAHLUNG (MAGNETIC)
See SYNCHROTRON RADIATION
BRIDGES (ELECTRIC)
See ELECTRIC BRIDGES
BRINES/CHEMICAL COMPOSITION
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
BRINES/SOLAR DISTILLATION
Desalination apparatus (Patent), 3:44470
BRINES/TOXICITY
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
BRITISH COLUMBIA/COAL DEPOSITS
B.C. policy to boost coal development, 3:44144
BRITISH COLUMBIA/COAL INDUSTRY
B.C. policy to boost coal development, 3:44144
BRITISH COLUMBIA/ENERGY POLICY
B.C. policy to boost coal development, 3:44144
BROMIDES/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
BROMINATED ALIPHATIC HYDROCARBONS/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
BROMINE/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
BROWN COAL/CHEMICAL ANALYSIS
Expression of results of coal analysis: the case for brown coals, 3:44075
BRUCE-1 REACTOR/NEUTRON FLUX
Flux distribution measurements in the Bruce A unit 1 reactor, 3:44672 (AECL-5833)
BRUCE-1 REACTOR/PRESSURE TUBES
Delayed hydrogen cracking of zirconium alloy pressure tubes, 3:44678 (CONF-760688-)
BRUCE-2 REACTOR/PRESSURE TUBES
Delayed hydrogen cracking of zirconium alloy pressure tubes, 3:44678 (CONF-760688-)
BUDKER ACCELERATORS
See PLASMA BETATRONS
BUILDINGS
See also ANIMAL SHELTERS
APARTMENT BUILDINGS
COMMERCIAL BUILDINGS
GREENHOUSES
HOUSES
OFFICE BUILDINGS
SCHOOL BUILDINGS
BUILDINGS/ENERGY CONSERVATION
Building design with regard to energy conservation, 3:44932
Discussion of heat mirror film: performance, production process, and cost estimates, 3:44925 (LBL-7812)
Energy conservation studies for new and existing buildings produce guidelines and standards-tools for decision making, 3:44924 (CONF-761220-)
Energy efficiency program for room air conditioners, central air conditioners, dehumidifiers, and heat pumps, 3:44926 (SAI-77-858-LJ)
New energy conservation ideas for existing and new buildings, 3:44923 (CONF-761220-)
Possibilities of improving the heat insulation of the windows, 3:44936 (UCRL-Trans-1549)
BUILDINGS/ENERGY CONSUMPTION
Building heating energy consumption at fixed facilities. Final report, April-June 1977, 3:44947 (AD-A-048324)
The building loads analysis and system thermodynamics (BLAST) program. Volume I. User's manual. Final report, 3:44921 (AD-A-048734)
BUILDINGS/ENERGY EFFICIENCY
Energy conservation: policy considerations for The States (Study by Council of State Governments), 3:44871
BUILDINGS/ENERGY MANAGEMENT
Energy engineer - a profession of the near future, 3:44933
BUILDINGS/EVAPORATIVE COOLING
Summer night cooling in Saudia Arabia, 3:44425 (CONF-761220-)
BUILDINGS/HEATING SYSTEMS
Planning a bivalent heating system for heating a one-family house, 3:44945

BUILDINGS/LIGHTING SYSTEMS
Daylight loading through protection against the Sun, 3:44930
BUILDINGS/PASSIVE SOLAR COOLING SYSTEMS
Summer night cooling in Saudia Arabia, 3:44425 (CONF-761220-)
BUILDINGS/PASSIVE SOLAR HEATING SYSTEMS
Significance of hybrid solar architecture, 3:44406 (CONF-761220-)
BUILDINGS/SOLAR AIR CONDITIONING
Comparison of simulated solar cooling systems in Saudia Arabia, 3:44432 (CONF-761220-)
BUILDINGS/SOLAR COOLING SYSTEMS
Solar cooling, Florida welcome station, 3:44423 (CONF-761220-)
Solar heating and cooling of buildings in Greece with special reference to schools, 3:44407 (CONF-761220-)
BUILDINGS/SOLAR HEATING SYSTEMS
Solar cooling, Florida welcome station, 3:44423 (CONF-761220-)
Solar heating and cooling of buildings in Greece with special reference to schools, 3:44407 (CONF-761220-)
Upton Community Multi-Purpose Center, Baltimore, Maryland, 3:44415 (CONF-761220-)
BUILDINGS/SOLAR WATER HEATERS
Upton Community Multi-Purpose Center, Baltimore, Maryland, 3:44415 (CONF-761220-)
BUILDINGS/SOLAR WATER HEATING
Solar energy system for domestic hot water heating (Museum of Science and Industry, Chicago), 3:44461 (CONF-761220-)
BUILDINGS/SOLAR-ASSISTED HEAT PUMPS
Upton Community Multi-Purpose Center, Baltimore, Maryland, 3:44415 (CONF-761220-)
BUILDINGS/SPACE HEATING
Building design with regard to energy conservation, 3:44932
Heat production and distribution in buildings with solar energy and heat pumps, 3:44931
Mixed control for radiators, 3:44928
BUILDINGS/WASTE HEAT UTILIZATION
Water and heat recycling, 3:44929
BUILDINGS/WINDOWS
Influence of tightening of the windows on the condensation and the heat economy, 3:44927 (UCRL-Trans-1548)
Discussion of heat mirror film: performance, production process, and cost estimates, 3:44925 (LBL-7812)
Possibilities of improving the heat insulation of the windows, 3:44936 (UCRL-Trans-1549)
BUMP-IN-TAIL INSTABILITY/QUASILINEAR PROBLEMS
Runaway electrons in collective electric fields, 3:45956
BUNKER OILS
See RESIDUAL FUELS
BUSES/FUEL CONSUMPTION
Advisory Council on Energy Conservation. Paper 5. Road vehicle and engine design: short- and medium-term energy considerations (Monograph), 3:44873
BWR TYPE REACTORS
See also GARIGLIANO REACTOR
MILLSTONE-1 REACTOR
PHIPPS BEND-1 REACTOR
PHIPPS BEND-2 REACTOR
RWE-BAYERNWERK REACTOR
BWR TYPE REACTORS/CONDENSATION CHAMBERS
Small-scale modeling of vertical loads for the boiling-water-reactor pressure-suppression system, 3:44816 (UCRL-50016-78-1)
BWR TYPE REACTORS/CONTAINMENT SYSTEMS
Computer simulations of a 1/5-scale experiment of a Mark I boiler water reactor pressure-suppression system under hypothetical LOCA conditions, 3:44815 (UCID-17782)
BWR TYPE REACTORS/ELECTRICAL EQUIPMENT
Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples, 3:44812 (SAND-78-0718)
BWR TYPE REACTORS/FUEL ELEMENT CLUSTERS
Spacer capture rod to spacer grid attachment device (Patent), 3:44644
BWR TYPE REACTORS/FUEL ELEMENTS
Fuel performance improvement program. Quarterly progress report, October-December 1977, 3:44639 (COO-4066-5)
BWR TYPE REACTORS/LOSS OF COOLANT
BWR pool dynamics in a loss of coolant accident. Calculation of the air-venting phase, 3:44818 (UCRL-52435)
Small-scale modeling of vertical loads for the boiling-water-reactor pressure-suppression system, 3:44816 (UCRL-50016-78-1)
Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples, 3:44812 (SAND-78-0718)
BWR TYPE REACTORS/MELTDOWN
Light water reactor safety research program. Quarterly report, July-September 1977 (Corium-concrete interactions; vapor explosions), 3:44810 (SAND-78-0076)
BWR TYPE REACTORS/MOLTEN METAL-WATER REACTIONS
Light water reactor safety research program. Quarterly report, July-September 1977 (Corium-concrete interactions; vapor explosions), 3:44810 (SAND-78-0076)
BWR TYPE REACTORS/PRESSURE VESSELS
Device for thermal insulation of a prestressed concrete vessel which affords resistance to the pressure of a vaporizable fluid contained in said vessel (Patent), 3:44646
Evaluation of the HSST program intermediate pressure vessel tests in terms of light-water-reactor pressure vessel safety, 3:44643 (IAEA-18; CONF-751268-)
BWR TYPE REACTORS/RADIOACTIVE EFFLUENTS
Measurement of liquid radioactive materials for monitoring radioactive emissions. Draft, 3:44714
BWR TYPE REACTORS/REACTOR COOLING SYSTEMS
EPRI programs in power reactor radiation control, 3:44638
Overview of the activated corrosion product reduction program for US power reactors, 3:44828

C

CADMIUM/ACTIVATION ANALYSIS
Mobile prompt-gamma in vivo neutron activation facility (^{238}Pu, Be), 3:45379 (BNL-24290)
CADMIUM/ADSORPTION
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
CADMIUM/BIOLOGICAL ACCUMULATION
Accumulation and excretion of heavy metals in organisms (/sup 115m/Cd, ^{203}Hg, Pb), 3:45378
CADMIUM/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
CADMIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
CADMIUM/ECOLOGICAL CONCENTRATION
Investigations of heavy metals and other persistent chemicals, Westernport Bay, Australia (Zn, Cu, and Cd in oysters), 3:45349
CADMIUM/EXCRETION
Toxicity of cadmium: mechanism and diagnosis, 3:45424
CADMIUM/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
Toxicity of cadmium: mechanism and diagnosis, 3:45424
CADMIUM 109/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
CADMIUM 115/BETA-MINUS DECAY
Unified description of odd-mass indium nuclei I. General theory and comparison to ^{1}13In and ^{1}15In levels populated in the decay of ^{1}13Sn and ^{1}15Cd/sup m/,g, 3:45737
CADMIUM 122/NUCLEAR STRUCTURE
Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{1}22Ag, 3:45739
CADMIUM 122/ROTATIONAL STATES
Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{1}22Ag, 3:45739
CADMIUM 122/VIBRATIONAL STATES
Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{1}22Ag, 3:45739
CADMIUM SULFIDE SOLAR CELLS/CHEMICAL PREPARATION
Structure and morphology of chemical-sprayed CdS films, 3:44373
CADMIUM SULFIDES/MICROSTRUCTURE
Structure and morphology of chemical-sprayed CdS films, 3:44373
CADMIUM SULFIDES/MORPHOLOGY
Structure and morphology of chemical-sprayed CdS films, 3:44373
CADMIUM SULFIDES/PHYSICAL RADIATION EFFECTS
Electron spin resonance in CdS:Mn single crystals irradiated with ^{60}Co γ rays, 3:45105
CADMIUM TELLURIDES/ELECTRONIC STRUCTURE
Conduction-electron spin resonance in Hg/sub 1-x/Cd/sub x/Te solid solutions, 3:45097
CALCIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590

CALCIUM/SELF-DIFFUSION
Self diffusion of calcium ions in soda lime and slag glasses, 3:45120 (ORNL-tr-4627)
CALCIUM 40/CHARGE DENSITY
Pion-exchange contributions to charge densities of closed-shell nuclei, 3:45691
CALCIUM 40/RANGE
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
CALCIUM 40/STOPPING POWER
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
CALCIUM 40 REACTIONS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
CALCIUM 40 TARGET/ALPHA REACTIONS
Lifetime and γ decay of the isomeric 19/2⁻ state in ⁴3Ti, 3:45722
CALCIUM 40 TARGET/CALCIUM 40 REACTIONS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
CALCIUM 40 TARGET/NEUTRON REACTIONS
Angular distribution measurements for radiative capture of fast neutrons by ⁴0Ca, 3:45727
CALCIUM 40 TARGET/OXYGEN 16 REACTIONS
$^{16}O + {}^{40}Ca$ inelastic scattering and direct-reaction calculations in heavy-ion scattering, 3:45725
CALCIUM 40 TARGET/PHOTONUCLEAR REACTIONS
Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV, 3:45563
CALCIUM 40 TARGET/PROTON REACTIONS
Isotopic dependence of the yield of ¹7N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
CALCIUM 44 TARGET/PROTON REACTIONS
Isotopic dependence of the yield of ¹7N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
CALCIUM 46/ENERGY LEVELS
Nuclear data sheets for A=46, 3:45723
CALCIUM 46/ENERGY-LEVEL TRANSITIONS
Nuclear data sheets for A=46, 3:45723
CALCIUM 48/CHARGE DENSITY
Pion-exchange contributions to charge densities of closed-shell nuclei, 3:45691
CALCIUM 48 TARGET/BERYLLIUM 9 REACTIONS
Yrast decay schemes from heavy-ion + ⁴8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CALCIUM 48 TARGET/BORON 11 REACTIONS
Mass and β decay of the new isotope ⁵7Cr, 3:45721
Yrast decay schemes from heavy-ion + ⁴8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CALCIUM 48 TARGET/CARBON 13 REACTIONS
Yrast decay schemes from heavy-ion + ⁴8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CALCIUM 48 TARGET/NITROGEN 15 REACTIONS
Yrast decay schemes from heavy-ion + ⁴8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CALCIUM 48 TARGET/OXYGEN 18 REACTIONS
Mass and β decay of the new neutron-rich isotope ^{60}Mn, 3:45729
CALCIUM CHLORIDES/LATENT HEAT STORAGE
Development of latent heat of fusion type materials, 3:44562 (CONF-761220-)
CALCIUM OXIDES/STABILITY
Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system (SiO_2-B_2O_3-Na_2O-CaO-Al_2O_3-Fe_2O_3), 3:44299 (ORNL-tr-4632)
CALCIUM OXIDES/X-RAY FLUORESCENCE ANALYSIS
Reduction in the error of determining the ash content of coal by the radioisotope method, 3:44081
CALIFORNIA
Coal utilization and conversion technologies: state-of-the-art, 3:44135 (NP-23211)
CALIFORNIA/GEOTHERMAL ENERGY
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 3:44600 (SAN-1326-1/1)
CALIFORNIA/URANIUM DEPOSITS
Hydrogeochemistry of uranium in the Walker River Basin, California and Nevada, 3:44233 (USGS-CIRC-753)
CALIFORNIUM 250 TARGET/ALPHA REACTIONS
Proton states in the Z = 99 nucleus ^{251}Es excited by ^{251}Fm electron capture decay and $^{250}Cf(\alpha,t)$ reaction, 3:45767
CALIFORNIUM 250 TARGET/DEUTERON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CALIFORNIUM 250 TARGET/PROTON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CALIFORNIUM 250 TARGET/TRITON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CALIFORNIUM 253/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
CALORIMETERS
Determining the gross and net calorific value of gaseous fuels, 3:44190
CALORIMETERS/DESIGN
Electric heat balance calorimeter. Final report (For assay of plutonium-bearing samples), 3:45268 (NUREG/CR-0054)
High resolution ac calorimeter for organic liquids, 3:45252
CALORIMETERS/LIQUID CRYSTALS
High resolution ac calorimeter for organic liquids, 3:45252
CALORIMETERS/OPERATION
Electric heat balance calorimeter. Final report (For assay of plutonium-bearing samples), 3:45268 (NUREG/CR-0054)
CAMAC SYSTEM
(Computer Application to Measurement And Control.)
CAMAC SYSTEM/DATA PROCESSING
Recommendations for CAMAC Serial Highway drivers and LAM Graders for the SCC-L2 Serial Crate Controller, 3:46137 (DOE/EV-0006)
CAMERA TUBES/DESIGN
100-ps framing-camera tube, 3:45269
CAMERA TUBES/STREAK PHOTOGRAPHY
100-ps framing-camera tube, 3:45269
CAMP
See AMP
CANADA
See also BRITISH COLUMBIA
CANADA/ENERGY DEMAND
Energy supply and demand forecasts - an overview, 3:44874 (CONF-760688-)
CANADA/ENERGY SUPPLIES
Energy supply and demand forecasts - an overview, 3:44874 (CONF-760688-)
CANADA/NUCLEAR INDUSTRY
Review of problems in nuclear industrial expansion, 3:44681 (CONF-760688-)
CANADA/NUCLEAR POWER
Future developments in nuclear power, 3:44716 (AECL-5800)
CANADA/RADIOACTIVE WASTE MANAGEMENT
Management of nuclear waste, 3:44288 (AECL-5800)
CANADA/RENEWABLE ENERGY SOURCES
Prospects for energy from alternate sources in Canada, 3:44897 (CONF-760688-)
CANADA/URANIUM DEPOSITS
New and recent results from the Canadian uranium reconnaissance program, 3:44230 (USGS-CIRC-753)
CANCER
See NEOPLASMS
CANDU TYPE REACTORS
Review of problems in nuclear industrial expansion, 3:44681 (CONF-760688-)
Unique characteristics of CANDU nuclear reactors, 3:44666 (AECL-5800)
CANDU TYPE REACTORS/CONVERSION RATIO
Overview of the potential of the CANDU reactor as a thermal breeder, 3:44663 (AECL-5679)
CANDU TYPE REACTORS/DESIGN
Heavy water nuclear station design, 3:44680 (CONF-760688-)
CANDU TYPE REACTORS/FISSION PRODUCTS
Tables of the isotopic composition of transuranium elements produced in Canadian D_2O moderated reactors, 3:44675 (AECL-5904)
CANDU TYPE REACTORS/FUEL CYCLE
Prospects for future CANDU fuel cycles, 3:44667 (AECL-5800)
Study of the running-in period of a CANDU-PHW thorium converter, 3:44662 (AECL-5391)

CANDU TYPE REACTORS/FUEL ELEMENT CLUSTERS
Flow-induced vibration of nuclear power station components, 3:44673 (AECL-5852)
CANDU TYPE REACTORS/HEAT EXCHANGERS
Flow-induced vibration of nuclear power station components, 3:44673 (AECL-5852)
CANDU TYPE REACTORS/PRIMARY COOLANT CIRCUITS
Techniques to reduce radiation fields, 3:44797 (CONF-760688-)
CANDU TYPE REACTORS/RADIATION PROTECTION
Designing to minimize radiation exposure, 3:44795 (CONF-760688-)
CANDU TYPE REACTORS/REACTOR CHARGING MACHINES
Effects of various treatments on the serviceability of water-immersed carbon-steel ball bearings, 3:44668 (AECL-5823)
Testing of unlubricated water-immersed carbon-steel ball bearings, 3:44669 (AECL-5824)
CANDU TYPE REACTORS/REACTOR COOLING SYSTEMS
Predicting radiation fields around reactor components, 3:44796 (CONF-760688-)
CANDU TYPE REACTORS/REACTOR DECOMMISSIONING
Decommissioning of CANDU nuclear stations, 3:44665 (AECL-5800)
CANDU TYPE REACTORS/REACTOR SAFETY
Nuclear power reactor safety, 3:44793 (AECL-5694)
Safety of CANDU reactors, 3:44794 (AECL-5800)
CANDU TYPE REACTORS/SPENT FUELS
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 1: starting materials: uranium ore, separated uranium and uranium mill tailings, and Part 2: irradiated fuel, 3:44661 (AECL-4436/1)
Tables of the isotopic composition of transuranium elements produced in Canadian D_2O moderated reactors, 3:44675 (AECL-5904)
CANDU TYPE REACTORS/STEAM GENERATORS
Dynamic simulation of a reboiler, 3:44664 (AECL-5680)
CANDU TYPE REACTORS/VALVES
Valve maintainability in CANDU-PHW nuclear generating stations, 3:44676 (AECL-5913)
CANONICAL EQUATIONS
See DIFFERENTIAL EQUATIONS
CAPILLARY FLOW/COMPUTER CALCULATIONS
High order finite element method for the calculation of capillary surfaces (Young-Laplace equation), 3:45866 (LBL-7291)
CARBOHYDRATES/CRACKING
Process for production of gas rich in methane which can be exchanged for natural gas (Patent), 3:44335
CARBON
See also GRAPHITE
PYROLYTIC CARBON
CARBON/DEPOSITION
Liquid phase methanation pilot plant operation and laboratory support work. Quarterly report, October 1, 1977-December 31, 1977, 3:44040 (FE-2036-24)
CARBON/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535
CARBON/MATERIALS TESTING
Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL-13801)
CARBON/PROTON REACTIONS
Inclusive pion production in relativistic proton collisions with nuclei, a reexamination, 3:45637
CARBON 11/RADIONUCLIDE KINETICS
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
CARBON 12/CHARGE DENSITY
Pion-exchange contributions to charge densities of closed-shell nuclei, 3:45691
CARBON 12 REACTIONS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
CARBON 12 REACTIONS/CAPTURE
Structure in the Radiative Capture of $^{1}2C$ by $^{1}2C$ near the coulomb barrier, 3:45701
CARBON 12 REACTIONS/FISSION
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from $^{1}94Hg$ compound nuclei, 3:45751
CARBON 12 REACTIONS/FRAGMENTATION
Fragmentation of ^{4}He, $^{1}2C$, $^{1}4N$, and $^{1}6O$ nuclei in nuclear emulsion at 2.1 GeV/nucleon, 3:45688
CARBON 12 REACTIONS/FUSION REACTIONS
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from $^{1}94Hg$ compound nuclei, 3:45751
Population of resonant $^{12}C + ^{12}C$ states via the reaction $^{12}C(^{16}O, \alpha)^{24}Mg$, 3:45699
CARBON 12 REACTIONS/PRECOMPOUND-NUCLEUS EMISSION
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from $^{1}94Hg$ compound nuclei, 3:45751
CARBON 12 TARGET/ALPHA REACTIONS
Description of backward maxima in cross sections with allowance for exchange processes, 3:45799
CARBON 12 TARGET/CARBON 12 REACTIONS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
Population of resonant $^{12}C + ^{12}C$ states via the reaction $^{12}C(^{16}O, \alpha)^{24}Mg$, 3:45699
Structure in the Radiative Capture of $^{1}2C$ by $^{1}2C$ near the coulomb barrier, 3:45701
CARBON 12 TARGET/NEUTRON REACTIONS
Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
CARBON 12 TARGET/OXYGEN 16 REACTIONS
Confirmation of 8^{+} assignment to the 11.86 MeV level in $^{2}4Mg$, 3:45706
Population of resonant $^{12}C + ^{12}C$ states via the reaction $^{12}C(^{16}O, \alpha)^{24}Mg$, 3:45699
CARBON 12 TARGET/OXYGEN 18 REACTIONS
$^{1}8O + ^{1}2C$ and $^{1}8O + ^{1}3C$ fusion-evaporation reactions, 3:45703
CARBON 12 TARGET/PION MINUS REACTIONS
Semi-inclusive π^{-} N reactions at 40 GeV/c, 3:45591
CARBON 12 TARGET/PION PLUS REACTIONS
Proton knockout from light nuclei by 170-MeV π^{+} mesons, 3:45710
CARBON 12 TARGET/PROTON REACTIONS
Analyzing power in proton-nucleus elastic scattering at 0.8 GeV, 3:45702
Energy spectra of nuclear fragments produced by high energy protons, 3:45707
CARBON 12 TARGET/TRITON REACTIONS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, $^{1}0B$, $^{1}1B$, and $^{1}2C$, 3:45705
CARBON 13/ISOTOPE RATIO
Natural gases in the south German Molasse Basin. Application of D/H and $^{13}C/^{12}C$ isotope analyses to deduce their origin, 3:44194
CARBON 13 REACTIONS/FUSION REACTIONS
Yrast decay schemes from heavy-ion + $^{4}8Ca$ fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CARBON 13 TARGET/OXYGEN 18 REACTIONS
$^{1}8O + ^{1}2C$ and $^{1}8O + ^{1}3C$ fusion-evaporation reactions, 3:45703
CARBON 14/ENERGY LEVELS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, $^{1}0B$, $^{1}1B$, and $^{1}2C$, 3:45705
CARBON 14/SELF-DIFFUSION
Self-diffusion processes in nuclear carbonitrides UC/sub x/N/sub 1-x/ and $(U,Pu)C_{0.8}N_{0.2}$, 3:45091
CARBON 14 TARGET/TRITON REACTIONS
$^{14}C(t,p)^{16}C$ reaction at 23 MeV, 3:45692
CARBON 16/ENERGY LEVELS
$^{14}C(t,p)^{16}C$ reaction at 23 MeV, 3:45692
CARBON 16/MASS
$^{14}C(t,p)^{16}C$ reaction at 23 MeV, 3:45692
CARBON BLACK/RECOVERY
ARC-coal acetylene process development program. Quarterly technical progress report No. 1, 9 January-31 March 1978, 3:44073 (TID-28423)
CARBON DIOXIDE/ABUNDANCE
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP-23013)
CARBON DIOXIDE/CHEMICAL REACTION KINETICS
High-temperature CO_2/O_2-coal reaction rate experiments (420 to 603°C), 3:44050 (LA-7277-MS)
CARBON DIOXIDE/CORROSIVE EFFECTS
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
CARBON DIOXIDE/ENVIRONMENTAL EFFECTS
CO_2 risk. Change in climate by increasing combustion within the next decades, 3:45309
How much more CO_2 can we take, 3:45305
Role of increasing CO_2 concentrations in the atmosphere, 3:45306
CARBON DIOXIDE/REMOVAL
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977-October 28, 1977, 3:44044 (FE-2416-20)
CARBON DIOXIDE LASERS/ENERGY TRANSFER
CO_2 laser systems for fusion experiments, 3:46121
CARBON DIOXIDE LASERS/MATHEMATICAL MODELS
Electron-beam-controlled gas-flow CO_2 laser, 3:45190

CARBON DIOXIDE LASERS/MODE LOCKING
Recent developments in high power CO_2 laser mode-locking and pulse selection, 3:45214
CARBON DIOXIDE LASERS/OPTICAL PUMPING
Laser action at 16 μ by optical pumping of CO_2 with an HF laser, 3:45204
CARBON DIOXIDE LASERS/OPTICAL SYSTEMS
Damage resistance of coated optics for pulsed CO_2 lasers, 3:45166 (LA-UR-78-931)
CARBON DIOXIDE LASERS/POWER
Electron-beam-controlled gas-flow CO_2 laser, 3:45190
CARBON DIOXIDE LASERS/RESEARCH PROGRAMS
Efficient high energy infrared third harmonic generation in gases and liquids for laser fusion applications. Annual progress report, 1 March 1977-28 February 1978, 3:45165 (COO-4251-6)
CARBON IONS/ION-ATOM COLLISIONS
Z, velocity, and charge dependence of zero-degree electron "cusps" from charge transfer to continuum states of bare and highly ionized projectiles, 3:45534
CARBON ISOTOPES/ISOTOPE RATIO
Stable carbon isotope ratios and chemical properties of kerogen and extractable organic matter in prephanerozoic and phanerozoic sediments: their interrelations and possible paleobiological significance, 3:44209
CARBON MONOXIDE/AUTOMOBILES
Waste gas control in cars as an active contribution to environmental protection, 3:44988
CARBON MONOXIDE/CORROSIVE EFFECTS
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
CARBON MONOXIDE/EXHAUST GASES
Waste gas control in cars as an active contribution to environmental protection, 3:44988
CARBON MONOXIDE/MONITORING
The 1976 NRL air quality data. Final report, 3:45289 (AD-A-048750)
CARBON MONOXIDE LASERS/EFFICIENCY
Effect of line selection on the output of a CO laser, 3:45203
CARBON MONOXIDE LASERS/EMISSION SPECTRA
Effect of line selection on the output of a CO laser, 3:45203
CARBON MONOXIDE LASERS/MATHEMATICAL MODELS
Laser dynamics and rotational relaxation in chemically formed carbon monoxide. Part 2. Further development and optimization of the chemical CO-laser, 3:45167 (N-77-33514)
CARBON MONOXIDE LASERS/RESEARCH PROGRAMS
Efficient high energy infrared third harmonic generation in gases and liquids for laser fusion applications. Annual progress report, 1 March 1977-28 February 1978, 3:45165 (COO-4251-6)
CARBON TETRACHLORIDE/AUGER EFFECT
Anomalous spectral and yield features of Auger emission from symmetric molecules, 3:45510
CARBON TETRAFLUORIDE/AUGER EFFECT
Anomalous spectral and yield features of Auger emission from symmetric molecules, 3:45510
CARBONITRIDES/FABRICATION
Self-diffusion processes in nuclear carbonitrides UC/sub x/N/sub 1-x/ and (U,Pu)$C_{0.8}N_{0.2}$, 3:45091
CARBONITRIDES/PERMEABILITY
Self-diffusion processes in nuclear carbonitrides UC/sub x/N/sub 1-x/ and (U,Pu)$C_{0.8}N_{0.2}$, 3:45091
CARBONIZATION/FLOWSHEETS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
CARBONIZATION/RESEARCH PROGRAMS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
CARCINOGENS/BIOLOGICAL EFFECTS
Carcinogens in the environment, 3:45421 (NP-23191)
Environmental quality. The sixth annual report of the Council on Environmental Quality, 3:45293 (NP-23191)
CARCINOGENS/HEALTH HAZARDS
Carcinogens in the environment, 3:45421 (NP-23191)
CASCADE IMPACTORS/PERFORMANCE
Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB-266103)
CASCADE THEORY/NUCLEON REACTIONS
High energy (E < or = 1000 GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data, 3:45641
CASCADE THEORY/PION REACTIONS
High energy (E < or = 1000 GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data, 3:45641
CASTING MOLDS/FABRICATION
No-bake systems in modern foundry technology, 3:44958 (IS-M-145)
CAT SCANNING/EQUIPMENT
Axial tomography (Patent), 3:45274
CATALYSIS/MEETINGS
Proceedings of the sixth international congress on catalysis, 3:45119
CATALYSTS/CHEMICAL PREPARATION
Catalyst for the treatment of hydrocarbons with hydrogen and method for its preparation (Patent), 3:44169
CATALYSTS/COMPARATIVE EVALUATIONS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
Catalyst development program for hydrodesulfurization and liquefaction of coal to produce clean boiler fuels. Monthly report, April 1978, 3:44066 (FE-2321-31)
CATALYSTS/DEACTIVATION
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1977, 3:44065 (FE-2315-19)
CATALYSTS/EVALUATION
Liquid phase methanation pilot plant installation and operation. Quarterly report, October 1, 1976-December 31, 1976, 3:44039 (FE-2036-21)
CATALYSTS/FABRICATION
Method for preparing fuel cell catalysts (Patent), 3:44914
CATALYSTS/FLUIDIZATION
Fluidized-bed cracking plant (Patent), 3:44165
CATALYSTS/PERFORMANCE TESTING
Liquid phase methanation pilot plant operation and laboratory support work. Quarterly report, October 1, 1977-December 31, 1977, 3:44040 (FE-2036-24)
CATALYSTS/POISONING
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
CATALYSTS/REGENERATION
Fluidized-bed cracking plant (Patent), 3:44165
Fluidized cracking catalyst regeneration apparatus (Patent), 3:44161
CATALYTIC COMBUSTORS/OPERATION
Catalytic combustion: a look back, a look forward, 3:45230 (CONF-771015-17)
CATALYTIC COMBUSTORS/REVIEWS
Catalytic combustion: a look back, a look forward, 3:45230 (CONF-771015-17)
CATALYTIC CONVERTERS/CATALYSTS
Chemistry of degradation in automotive emission control catalysts, 3:44992
Comparison of platinum and base metal oxidation catalysts, 3:44991
Deposition and distribution of lead, phosphorus, calcium, zinc, and sulfur poisons on automobile exhaust NO/sub x/ catalysts, 3:44986
Optimum distribution of catalytic material on support layers in automotive catalysis, 3:44993
Oxidation of CO and C_2H_4 by base metal catalysts prepared on honeycomb supports, 3:44996
Oxidative automotive emission control catalysts: selected factors affecting catalyst activity, 3:44994
Platinum catalysts for exhaust emission control: the mechanism of catalyst poisoning by lead and phosphorus compounds, 3:44985
Spinel solid solution catalysts for automotive applications, 3:44995
Thermodynamic interaction between transition metals and simulated auto exhaust, 3:44984
CATALYTIC CONVERTERS/MEETINGS
Catalysts for the control of automotive pollutants (Fourteen papers), 3:44981
CATALYTIC CONVERTERS/PERFORMANCE TESTING
Catalytic reduction of oxides of nitrogen emissions into auto exhaust gas, 3:44982
Oxidation of CO and C_2H_4 by base metal catalysts prepared on honeycomb supports, 3:44996
Relative resistance of noble metal catalysts to thermal deactivation, 3:44989
Variation of selectivity with support chemistry in NO/sub x/ removal catalysts, 3:44990
CATALYTIC CONVERTERS/SUBSTRATES
Thermally stable carriers, 3:44987
CATALYTIC CRACKING/CATALYSTS
Hydrocarbon hydroconversion process employing hydroxy-aluminum stabilized catalysts supports (Patent), 3:44160
CE ENTRAINED FUEL PROCESS/ENVIRONMENTAL IMPACTS
Environmental considerations for low-Btu gasification of coal for electric power generation, 3:44037 (FE-1545-44)

CELLS (ANIMAL)
See ANIMAL CELLS
CELLS (BACTERIAL)
See BACTERIA
CELLS (PLANT)
See PLANT CELLS
CELLS (REACTOR)
See REACTOR CELLS
CELLULOSE/BIOCONVERSION
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
CELLULOSE/BIOSYNTHESIS
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
CERAMICS/DEFORMATION
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
CERAMICS/ELASTICITY
Elastic properties of a lithia-alumina-silica glass-ceramic at high pressure, 3:45068
CERAMICS/MECHANICAL PROPERTIES
Coal gasification valves: Phase II. Quarterly technical progress report, September 1977-November 1977 (High temperature), 3:44042 (FE-2355-2(Rev.E))
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
CERAMICS/MICROSTRUCTURE
High resolution and high voltage electron microscopy at the University of California, Berkeley, 3:45010 (LBL-6998)
CEREBROSPINAL FLUID/FLUID FLOW
Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer-assisted CNS studies, 3:45393
CERIUM 144/INTESTINAL ABSORPTION
Gastrointestinal absorption and distribution of ^{144}Ce in the suckling pig, 3:45405
CERIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
CERRO PRIETO GEOTHERMAL FIELD/EXPLOITATION
Geothermal field of Cerro Prieto on the San Jacinto Fault and its possible extension towards the Imperial Fault, 3:44573 (UCRL-Trans-1547)
CERRO PRIETO GEOTHERMAL FIELD/**GEOTHERMAL EXPLORATION**
Geothermal field of Cerro Prieto on the San Jacinto Fault and its possible extension towards the Imperial Fault, 3:44573 (UCRL-Trans-1547)
CESIUM/ATOM-ATOM COLLISIONS
Production of polarized H^- or D^- ions by a colliding-beam method, 3:45502
CESIUM/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
CESIUM/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
CESIUM 133/PARITY
Possible suppression of P-odd effects in heavy atoms, 3:45516
CESIUM 137/RADIATION MONITORING
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
CESIUM CHLORIDES/ATOM-MOLECULE COLLISIONS
Collision-induced ion-pair formation of CsCl and Cs_2Cl_2, 3:45526
CESIUM IONS/DIFFUSION
Mobilities and longitudinal diffusion coefficients for Cs^+ ions in He and Ne gas, 3:45093
CESIUM IONS/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535
CESIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
CFRMF REACTOR
Fission product and reactor dosimetry studies at Coupled Fast Reactivity Measurements Facility, 3:44785 (TREE-1259)
CHARGE-EXCHANGE REACTIONS/ISOSPIN
Extension of core polarization in inelastic scattering to include charge-exchange reactions, 3:45792
CHARGING MACHINES (REACTOR)
See REACTOR CHARGING MACHINES
CHARM PARTICLES/LEPTONIC DECAY
Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber, 3:45571
CHARM PARTICLES/**PARTICLE PRODUCTION**
Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber, 3:45571
CHARMONIUM/DECAY
Charmonium and quantum chromodynamics, 3:45673
CHARMONIUM/ENERGY LEVELS
Charmonium and quantum chromodynamics, 3:45673
CHEMICAL EFFLUENTS/ENVIRONMENTAL TRANSPORT
Draft environmental impact statement. Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico, 3:45324 (DOE/EIS-0018-D)
CHEMICAL EXPLOSIVES
See also PETN
CHEMICAL EXPLOSIVES/**PERFORMANCE TESTING**
Explosively produced fracture of oil shale. Progress report, April-June 1977, 3:44200 (LA-6901-PR)
CHEMICAL EXPLOSIVES/**RESEARCH PROGRAMS**
Explosives technology, 3:45282 (UCRL-50019-77-1)
Organic Materials Division quarterly report, January-March 1977, 3:45078 (UCRL-50019-77-1)
CHEMICAL EXPLOSIVES/**TEST FACILITIES**
Blast forecasting guide for the Site 300 Meteorology Center, 3:45281 (UCID-17822)
CHEMICAL EXPLOSIVES/**TITRATION**
Titrimetry is alive and well at LLL, 3:45110 (UCRL-80878)
CHEMICAL FEEDSTOCKS
See also PETROCHEMICALS
CHEMICAL FEEDSTOCKS/**BIOSYNTHESIS**
Background information for the economic assessment of solvent fermentation processes, 3:44387 (COO-4070-4)
CHEMICAL FEEDSTOCKS/**COST**
Background information for the economic assessment of solvent fermentation processes, 3:44387 (COO-4070-4)
CHEMICAL INDUSTRY/CO-GENERATION
Cogeneration of steam and electric power (Book; 4 parts), 3:44870
CHEMICAL INDUSTRY/**ENERGY CONSERVATION**
Maximum energy efficiency improvement target for SIC 28: Chemical and Allied Products Industry, 3:44955 (FEA/D-77/243)
CHEMICAL INDUSTRY/**WASTE MANAGEMENT**
Alternatives for hazardous waste management in the inorganic chemicals industry. Final report, September 1976-January 1977, 3:45362 (PB-274565)
CHEMICAL LASERS/EXPLOSIONS
Spontaneous explosions in multiatmosphere H_2-F_2-O_2 mixtures, 3:45177
CHEMICAL LASERS/**NOZZLES**
Boundary layer effects in chemical laser nozzle inlet. Interim report, 3:45157 (AD-A-048447)
CHEMICAL LASERS/**PERFORMANCE TESTING**
Chemical laser potential of selected group IV-A metal oxides. Final report, 3:45161 (AD-A-048779)
CHEMICAL LASERS/**RESEARCH PROGRAMS**
Research on molecular lasers. Final report, 1 October 1968-30 September 1976, 3:45159 (AD-A-048643)
CHEMICAL REACTORS/CATALYTIC CRACKING
Fluidized-bed cracking plant (Patent), 3:44165
CHESAPEAKE BAY/POLLUTION
Mercury distribution in the Chesapeake Bay, 3:45350
CHEST/MEASURING METHODS
New developments in ultrasonic imaging of the chest and other body organs, 3:45381 (UCRL-80340(Rev.1))
CHEST/THICKNESS
New developments in ultrasonic imaging of the chest and other body organs, 3:45381 (UCRL-80340(Rev.1))
CHICAGO PILE-2 REACTOR
See CP-2 REACTOR
CHILDREN/RESPIRATORY SYSTEM DISEASES
Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis, 3:45422 (PB-274339)
CHINA/NUCLEAR EXPLOSIONS
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
CHLORIDES/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
CHLORINE/CARBON 12 REACTIONS
Dynamics of collision of fast nuclei ($E \sim 200$ MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
CHLORINE 35/RANGE
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812

CHLORINE 35/STOPPING POWER
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
CHLORINE 35 REACTIONS/FUSION REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
CHLORINE COMPOUNDS/NUCLEAR MAGNETIC RESONANCE
Rotating frame NMR relaxation study of gaseous ClF, 3:45494
CHLORINE IONS/ION-ATOM COLLISIONS
Target-thickness dependence of radiative electron capture in heavy-ion collisions, 3:45529
CHOOZ REACTOR
See ARDENNES REACTOR
CHROMATIN/CHEMICAL COMPOSITION
Important hydrodynamic and spectroscopic techniques in the field of chromatin structure, 3:45370 (CONF-780445-2)
CHROMATIN/MORPHOLOGY
Electron microscopy: a tool for visualizing chromatin, 3:45369 (CONF-780445-1)
Important hydrodynamic and spectroscopic techniques in the field of chromatin structure, 3:45370 (CONF-780445-2)
CHROMIUM/BIOLOGICAL EFFECTS
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
CHROMIUM/ECOLOGICAL CONCENTRATION
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
CHROMIUM/ELECTROPLATING
New black chrome selective absorbing surface, 3:44483 (CONF-761220-)
CHROMIUM 46/ENERGY LEVELS
Nuclear data sheets for A=46, 3:45723
CHROMIUM 46/ENERGY-LEVEL TRANSITIONS
Nuclear data sheets for A=46, 3:45723
CHROMIUM 54/ENERGY-LEVEL TRANSITIONS
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CHROMIUM 54/HIGH SPIN STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CHROMIUM 54/YRAST STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CHROMIUM 55/ENERGY-LEVEL TRANSITIONS
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CHROMIUM 55/HIGH SPIN STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CHROMIUM 55/YRAST STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
CHROMIUM 57/BETA-MINUS DECAY
Mass and β decay of the new isotope ^{57}Cr, 3:45721
CHROMIUM 57/MASS
Mass and β decay of the new isotope ^{57}Cr, 3:45721
CHROMIUM ALLOYS
See also INCONEL ALLOYS
STAINLESS STEELS
CHROMIUM ALLOYS/CORROSION
Potentiostatic study on anodic behavior of iron-chromium alloys, 3:45054 (ORNL-tr-4622)
CHROMIUM ALLOYS/CORROSION RESISTANCE
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June-31 August 1977, 3:45053 (FE-2299-15)
CHROMIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
CHROMIUM OXIDES/ELECTROPLATING
New black chrome selective absorbing surface, 3:44483 (CONF-761220-)
CHROMIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
CHROMODYNAMICS
See QUANTUM CHROMODYNAMICS
CHROMOSOMAL ABERRATIONS/GENETIC EFFECTS
Chromosomal translocation causing overproduction of iso-2-cytochrome c in yeast, 3:45373
CHRONIC ADMINISTRATION
See CHRONIC INTAKE
CHRONIC INTAKE/BIOLOGICAL EFFECTS
Observations of a cold-water intertidal community after 5 years of a low-level, persistent oil spill from the General M.C. Meigs, 3:45411
CLAMS
See MOLLUSCS
CLINCH RIVER BREEDER REACTOR/REACTOR COMPONENTS
Role and progress of the Clinch River Breeder Reactor Plant, 3:44688 (CONF-780440-1)
CLINCH RIVER BREEDER REACTOR/SEALS
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978, 3:44685 (AI-DOE-13231)
CLOSED-CYCLE MHD GENERATORS/FEASIBILITY STUDIES
Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1-June 30, 1976, 3:44900 (FE-2238-1)
COAL
See also ANTHRACITE
BITUMINOUS COAL
BROWN COAL
COAL GASIFICATION
COAL LIQUEFACTION
LIGNITE
SOLVENT-REFINED COAL
SUBBITUMINOUS COAL
COAL/AGGLOMERATION
Comparison of coal beneficiation methods, 3:44123 (IS-ICP-50)
COAL/ALKYLATION
Coal anion structure and chemistry of coal alkylation. Fourth quarterly progress report, December 1, 1977-February 28, 1978, 3:44074 (COO-4227-4)
COAL/BRIQUETTING
Plastic properties of coals and their briquetting, 3:44130
COAL/CALORIFIC VALUE
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
COAL/CARBONIZATION
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
Some directions of the technological processing of coals, 3:44023
COAL/CHEMICAL PROPERTIES
Petrographic characteristics and technological properties of coals of the Krasnoarmeiskii region of the Donbass, 3:44080
COAL/CHEMICAL REACTION KINETICS
High-temperature CO_2/O_2-coal reaction rate experiments (420 to 603°C), 3:44050 (LA-7277-MS)
COAL/CHEMICAL REACTIONS
Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification, 3:44046 (FE-2518-14)
COAL/CLASSIFICATION
Comparison of the classification of coals used in individual countries with the International Classification, 3:44083
Petrographic characteristics and technological properties of coals of the Krasnoarmeiskii region of the Donbass, 3:44080
COAL/COKING
Addition of lean coals to charges with an increased content of gas coals of the Western Donbass, 3:44027
COAL/COMBUSTION
Coal handling and coal burning for electricity generation in large power stations in the Federal Republic of Germany, 3:44127
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA-11(Vol.1)(Draft))
Nucleation and evolution of slag droplets in coal combustion, 3:44132 (CONF-780307-8)
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
COAL/COMBUSTION KINETICS
Rates and mechanisms of pulverized coal combustion. First annual report, 3:44136 (SAND-78-8234)
COAL/COMBUSTION PROPERTIES
Clean coal combustion through coal washing and blending, 3:44126 (PB-274406)
COAL/CONSUMPTION RATES
Legislation: energy law. Act amending the third electricity generation act, 3:44145
COAL/CRUSHING
Comparison of coal beneficiation methods, 3:44123 (IS-ICP-50)
COAL/DESULFURIZATION
Action of aqueous alkali on pyrite (Ph.D. dissertation), 3:44030 (IS-ICP-51)

Clean coal combustion through coal washing and blending, 3:44126 (PB-274406)
Comparison of coal beneficiation methods, 3:44123 (IS-ICP-50)
Desulfurizing coal with solutions containing dissolved oxygen, 3:44029 (IS-ICP-48)
Method to desulphurize coal (Patent), 3:44032

COAL/DEVOLATILIZATION
Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification, 3:44046 (FE-2518-14)

COAL/FLOTATION
Comparison of coal beneficiation methods, 3:44123 (IS-ICP-50)

COAL/FLUIDIZED-BED COMBUSTION
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)
Conceptual design for an atmospheric fluidized-bed direct combustion power generating plant. Phase I. Commercial plant conceptual design. Annual report, January 14, 1977-January 31, 1978, 3:44608 (FE-2583-13)
Fluid bed combustion: boilers ordered but generators face severe problems, 3:44137
Gas-solids interactions in the distribution zone of a fluidized bed: Phase I. Quarterly report, May 1-July 31, 1977, 3:44133 (FE-2451-5)
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
Multicell fluidized-bed boiler design, construction, and test program. Monthly progress report No. 66, 3:44614 (FE-1237-T-7)
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
Supportive studies in fluidized-bed combustion. Quarterly report, July-September 1977, 3:44131 (ANL/CEN/FE-77-8)
U.S. utility to experiment with fluidised bed, 3:44138

COAL/GLOBAL ASPECTS
Coal on the switchback: the coal industry since nationalisation (Book), 3:44886

COAL/GRINDING
Comparison of coal beneficiation methods, 3:44123 (IS-ICP-50)

COAL/HYDROGENATION
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly report, July-September 1976, 3:44033 (FE-2305-3)
Method for the hydrogenating extraction of coal (Patent), 3:44034
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
Some directions of the technological processing of coals, 3:44023
Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification, 3:44046 (FE-2518-14)

COAL/MARKET
Coal on the switchback: the coal industry since nationalisation (Book), 3:44886

COAL/MATERIALS HANDLING
Coal handling and coal burning for electricity generation in large power stations in the Federal Republic of Germany, 3:44127

COAL/PETROLOGY
Petrographic characteristics and technological properties of coals of the Krasnoarmeiskii region of the Donbass, 3:44080

COAL/PLASTICITY
Plastic properties of coals and their briquetting, 3:44130

COAL/PRODUCTION
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB-273847)

COAL/PYROLYSIS
High-temperature CO_2/O_2-coal reaction rate experiments (420 to 603°C), 3:44050 (LA-7277-MS)
Kinetics of the thermal decomposition of coal under nonisothermal conditions, 3:44071

COAL/RADIOMETRIC ANALYSIS
Reduction in the error of determining the ash content of coal by the radioisotope method, 3:44081

COAL/REFLECTIVITY
Measurement of the reflectance of vitrinities in partially polarized light, 3:44082

COAL/RESEARCH PROGRAMS
Kentucky energy resource utilization program. Semiannual report, 1 January-30 June 1977, 3:44863 (PB-274408)

COAL/REVIEWS
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)

COAL/SOLVENT EXTRACTION
Method for the hydrogenating extraction of coal (Patent), 3:44034

COAL/SORPTIVE PROPERTIES
Adsorption of vapors of organic substances on coal, 3:44078

COAL/STORAGE
Bunkering and storing coal for large power plants, 3:44129

COAL/TRANSPORT
Coal handling and coal burning for electricity generation in large power stations in the Federal Republic of Germany, 3:44127
Financing public expenditures for energy-impacted roads, 3:44125 (PB-274405)
High-value energy needs more efficient conversion, transport, 3:44128

COAL/WASHING
Comparison of coal beneficiation methods, 3:44123 (IS-ICP-50)

COAL DEPOSITS/HYDROLOGY
Seam extraction conditions in the Western Donbass classified according to the hydrogeological factors, 3:44115

COAL DEPOSITS/LEASING
Summary of problems associated with coal reserve estimates (Definitions and validity of reserve and resources), 3:44092 (EMD-78-23)

COAL DEPOSITS/PERMEABILITY
Seam extraction conditions in the Western Donbass classified according to the hydrogeological factors, 3:44115

COAL DEPOSITS/WATER SATURATION
Rod-shaped probe for soaking minerals to be mined, especially coal in mining (Patent), 3:44119

COAL GASIFICATION
See also IN-SITU GASIFICATION
LIQUID PHASE METHANATION PROCESS
Method to convert coal and water into at least hydrocarbon and system to carry out such a method (Patent, reactor process heat), 3:44059
Some directions of the technological processing of coals, 3:44023

COAL GASIFICATION/COMPARATIVE EVALUATIONS
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)

COAL GASIFICATION/ENTRAINMENT
Mixing and gasification of coal in entrained flow systems. Quarterly technical progress report No. 2, July 1-September 30, 1977, 3:44047 (FE-2666-2)
Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification, 3:44046 (FE-2518-14)

COAL GASIFICATION/FEASIBILITY STUDIES
Hydrogen or methane: future processes for the production of SNG, 3:44057

COAL GASIFICATION/FLUIDIZED BED
Hydrodynamic modeling of fluidized-bed gasifiers and combustors, 3:44054 (UCID-17759)

COAL GASIFICATION/MATHEMATICAL MODELS
Mixing and gasification of coal in entrained flow systems. Quarterly technical progress report No. 2, July 1-September 30, 1977, 3:44047 (FE-2666-2)
Theory of pulverized coal conversion in entrained flows. Part I. Hydrogasification, 3:44046 (FE-2518-14)

COAL GASIFICATION/REVIEWS
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)

COAL GASIFICATION/TECHNOLOGY ASSESSMENT
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB-273847)
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)

COAL GASIFICATION/WASTE WATER
Preliminary evaluation of the biological oxidation of thiocyanates. Progress report, November 30, 1977-February 28, 1978, 3:44085 (COO-4502-2)

COAL GASIFICATION PLANTS/DESIGN
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977-October 28, 1977, 3:44044 (FE-2416-20)
Overall Plant Design Description (OPDD), low-Btu CO gas electric power plant, 3:44607 (FE-1806-23)

COAL GASIFICATION PLANTS/FLOWSHEETS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)

COAL GASIFICATION PLANTS/FUEL FEEDING SYSTEMS
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977-October 28, 1977, 3:44044 (FE-2416-20)

Development of a continuous dry coal screw feeder: Phase II. Quarterly technical progress report, April 1, 1977-June 30, 1977, 3:44038 (FE-1794-25)
COAL GASIFICATION PLANTS/MATERIALS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
COAL GASIFICATION PLANTS/MATERIALS TESTING
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
COAL GASIFICATION PLANTS/PRESSURE VESSELS
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
COAL GASIFICATION PLANTS/SITE SELECTION
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA-11(Vol.1)(Draft))
COAL GASIFICATION PLANTS/VALVES
Coal gasification valves: Phase II. Quarterly technical progress report, September 1977-November 1977 (High temperature), 3:44042 (FE-2355-2(Rev.E))
COAL INDUSTRY
B.C. policy to boost coal development, 3:44144
COAL INDUSTRY/ENVIRONMENTAL EFFECTS
Assessment of the health and environmental effects of power generation in the Midwest. Volume II. Ecological effects, 3:44088 (ANL/AA-6(Vol.2)(DRAFT))
COAL INDUSTRY/ENVIRONMENTAL IMPACTS
Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB-274107)
COAL INDUSTRY/GOVERNMENT POLICIES
Coal on the switchback: the coal industry since nationalisation (Book), 3:44886
COAL INDUSTRY/HEALTH HAZARDS
Assessment of the health and environmental effects of power generation in the Midwest. Volume II. Ecological effects, 3:44088 (ANL/AA-6(Vol.2)(DRAFT))
COAL INDUSTRY/RESEARCH PROGRAMS
Joint research work in the field of coal refining is carried out by the German coal mining industry, 3:44022
COAL LIQUEFACTION
Some directions of the technological processing of coals, 3:44023
COAL LIQUEFACTION/CATALYSTS
Catalyst development program for hydrodesulfurization and liquefaction of coal to produce clean boiler fuels. Monthly report, April 1978, 3:44066 (FE-2321-31)
COAL LIQUEFACTION/COMPARATIVE EVALUATIONS
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)
COAL LIQUEFACTION/REVIEWS
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)
COAL LIQUEFACTION/TECHNOLOGY ASSESSMENT
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB-273847)
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
COAL LIQUEFACTION PLANTS/MATERIALS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
COAL LIQUIDS/CATALYTIC CRACKING
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
COAL LIQUIDS/CENTRIFUGATION
Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April-June 1977, 3:44062 (FE-2270-24)
Solvent refined coal (SRC) process. Operation of solvent refined coal pilot plant at Wilsonville, Alabama. Monthly technical progress report, March 1978, 3:44063 (FE-2270-29)
COAL LIQUIDS/CHARGES
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1-May 31, 1977, 3:44067 (FE-2353-17)
COAL LIQUIDS/CHEMICAL REACTIONS
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
COAL LIQUIDS/CHROMATOGRAPHY
Chromatographic investigations of the components of the liquid nonvolatile constituents of the plastic mass of coal, 3:44077
COAL LIQUIDS/COMBUSTION PRODUCTS
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1-December 30, 1977, 3:44615 (FE-1765-42)
COAL LIQUIDS/COMBUSTION PROPERTIES
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1-May 31, 1977, 3:44067 (FE-2353-17)
COAL LIQUIDS/DEMINERALIZATION
Research on cross-flow filtration for solids removal from coal syncrudes. Final report, 3:44061 (FE-2245-16)
Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April-June 1977, 3:44062 (FE-2270-24)
COAL LIQUIDS/DENSITY
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1-May 31, 1977, 3:44067 (FE-2353-17)
COAL LIQUIDS/DISTILLATION
Solvent refined coal (SRC) process. Operation of solvent refined coal pilot plant at Wilsonville, Alabama. Monthly technical progress report, March 1978, 3:44063 (FE-2270-29)
COAL LIQUIDS/FILTRATION
Research on cross-flow filtration for solids removal from coal syncrudes. Final report, 3:44061 (FE-2245-16)
Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April-June 1977, 3:44062 (FE-2270-24)
Solvent refined coal (SRC) process. Operation of solvent refined coal pilot plant at Wilsonville, Alabama. Monthly technical progress report, March 1978, 3:44063 (FE-2270-29)
COAL LIQUIDS/HYDROCRACKING
Mass transport characteristics of zeolite cracking catalysts. Quarterly report, September 30-December 31, 1977, 3:44068 (FE-2727-1)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
COAL LIQUIDS/PRECIPITATION
Chromatographic investigations of the components of the liquid nonvolatile constituents of the plastic mass of coal, 3:44077
COAL LIQUIDS/REFINING
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1-May 31, 1977, 3:44067 (FE-2353-17)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1977, 3:44065 (FE-2315-19)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
COAL LIQUIDS/VISCOSITY
Fossil Energy Development Programs. Quarterly report, October 1-December 31, 1977, 3:44052 (SAND-78-0653)
COAL MINERS/COMMUNICATIONS
Evaluation of experimental and developmental communication systems used in underground coal mines. Performance of trapped-miner communication system. Final report, 1 April 1976-31 January 1977, 3:44100 (PB-274683)
COAL MINERS/SAFETY
Reflections on working safety in bituminous coal mining, 3:44139
COAL MINES
Up and AteM: Bentley Colliery, 3:44108
COAL MINES/ACID MINE DRAINAGE
Coal and coal mine drainage, 3:44087
COAL MINES/BACKFILLING
Pump-packing systems at Florence Colliery, 3:44103
COAL MINES/COMMUNICATIONS
Evaluation of experimental and developmental communication systems used in underground coal mines. Performance of trapped-miner communication system. Final report, 1 April 1976-31 January 1977, 3:44100 (PB-274683)
COAL MINES/FIRES
Temperature monitoring at the seat of fires using the ethylene-acetylene ratio, 3:44116
COAL MINES/GROUND WATER
Lightweight and cheap depth sampler, 3:44110
Predicting water inflow in the Kuzbass pits, 3:44113
COAL MINES/MINING EQUIPMENT
Optimal choice and conditions for the use of tires in mines, quarries, public works, and civil engineering, 3:44112
Use of pneumatics by Houilleres de Provence, 3:44111
COAL MINES/ROCK MECHANICS
Energy changes due to mining, 3:44117

COAL MINES/VENTILATION
Evaluation of the use of air curtains to increase face ventilation. Final report, April 1975-March 1977, 3:44096 (PB-274324)
COAL MINES/WORKING CONDITIONS
Use of polymer solution for consolidation of coal seams, 3:44140
COAL MINING
See also ACID MINE DRAINAGE
LONGWALL MINING
SURFACE MINING
UNDERGROUND MINING
COAL MINING/ACCIDENTS
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
COAL MINING/HEALTH HAZARDS
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
COAL MINING/INFORMATION CENTERS
Structure and method of operation of the section 'bibliography, documentation' and its importance for the research work of the Tremonia experimental mine (German Federal Republic), 3:46147
COAL MINING/INFORMATION RETRIEVAL
Structure and method of operation of the section 'bibliography, documentation' and its importance for the research work of the Tremonia experimental mine (German Federal Republic), 3:46147
COAL MINING/PRODUCTIVITY
Designing for bulk output from thin seams using the AS buttock shearer, 3:44105
COAL MINING/WASTE MANAGEMENT
Coal mine waste (a bibliography with abstracts). Report for 1964-January 1978, 3:44086 (NTIS/PS-78/0052)
COAL PREPARATION
Clean coal combustion through coal washing and blending, 3:44126 (PB-274406)
COAL PREPARATION/COMPARATIVE EVALUATIONS
Comparison of coal beneficiation methods, 3:44123 (IS-ICP-50)
COAL PREPARATION/ECONOMICS
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
COAL PREPARATION/ENVIRONMENTAL IMPACTS
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
COAL PREPARATION/REVIEWS
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
COAL PREPARATION PLANTS/INSPECTION
Inspection manual for the enforcement of new source performance standards: coal preparation plants. Final report, 3:44124 (PB-274262)
COAL PREPARATION PLANTS/REGULATIONS
Inspection manual for the enforcement of new source performance standards: coal preparation plants. Final report, 3:44124 (PB-274262)
COAL RESERVES
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB-273847)
COAL RESERVES/FORECASTING
Summary of problems associated with coal reserve estimates (Definitions and validity of reserve and resources), 3:44092 (EMD-78-23)
COAL-DERIVED LIQUIDS
See COAL LIQUIDS
COAL-FIRED MHD GENERATORS/COMBUSTORS
Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1-June 30, 1976, 3:44900 (FE-2238-1)
COAL-FIRED MHD GENERATORS/FEASIBILITY STUDIES
Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1-June 30, 1976, 3:44900 (FE-2238-1)
COAL-FIRED MHD GENERATORS/FLOW MODELS
Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1-June 30, 1976, 3:44900 (FE-2238-1)
COAL-FIRED MHD GENERATORS/HEAT EXCHANGERS
Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1-June 30, 1976, 3:44900 (FE-2238-1)
COASTAL REGIONS/BIOLOGICAL RECOVERY
Recolonization of rocky shores in Cornwall after use of toxic dispersants to clean up the Torrey Canyon spill, 3:44180
COASTAL WATERS/AQUATIC ECOSYSTEMS
Recommendations for microbiological studies in the Continental Shelf Areas. Results from two workshops convened 10-11 August 1976 and 19-20 October 1976 in Boulder, Colorado. Outer Continental Shelf environmental assessment program. Technical memo, 3:44143 (PB-274660)
COASTAL WATERS/RESEARCH PROGRAMS
Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED-78-93)
COASTAL WATERS/SEA LEVEL
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
COASTAL WATERS/TIDE
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
COASTAL WATERS/WATER POLLUTION
Water resources research program. Pollution of coastal waters off Chicago by sinking plumes from the Indiana Harbor Canal, 3:45327 (ANL/WR-77-2)
COATED FUEL PARTICLES/DISSOLUTION
Apparatuses for the dissolution of resistent nuclear fuel for analytical sample preparation, 3:44265 (AIAU-77503)
COATED FUEL PARTICLES/FISSION PRODUCT RELEASE
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978, 3:44657 (GA-A-14863)
COATED FUEL PARTICLES/PRODUCTION
Design study for a 24-cm HTGR microsphere coating furnace, 3:44261 (ORNL/TM-6321)
COATINGS
See also ANTIREFLECTION COATINGS
BLACK COATINGS
COATINGS/THICKNESS
Card controlled beta backscatter thickness measuring instrument (Patent), 3:45264
COBALT/CATALYTIC EFFECTS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
COBALT 59/ENERGY LEVELS
Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu (Wood-Saxon and Nilsson potentials, spin-cutoff parameters, m value, π, J, partition function inversion), 3:45717
COBALT COMPOUNDS/CATALYTIC EFFECTS
Process for improved carbon-supported hydrodesulfurization catalysts (Patent), 3:44159
COBALT ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
COBALT OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
COBALT OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
COFFINITE/CHEMICAL COMPOSITION
Characterization of fine-grained black uranium ores by transmission electron microscopy, 3:44248 (USGS-CIRC-753)
COFFINITE/CRYSTAL STRUCTURE
Characterization of fine-grained black uranium ores by transmission electron microscopy, 3:44248 (USGS-CIRC-753)
CO-GENERATION
Cogeneration of steam and electric power (Book; 4 parts), 3:44870
COKE/CHEMICAL PROPERTIES
Study of the physicochemical properties of activated coke, 3:44084
COKE/HEAT TRANSFER
Cooling of solid particles with irregularly shaped surfaces, 3:44076
COKE/PHYSICAL PROPERTIES
Study of the physicochemical properties of activated coke, 3:44084
COKE OVENS/DESIGN
Equipment to carbonize fine-grained fuels (Patent), 3:44026
COKE OVENS/GASEOUS WASTES
Steel industry wastes, 3:44965
COKE OVENS/LIQUID WASTES
Steel industry wastes, 3:44965
COKE OVENS/MATERIALS HANDLING
Coking furnace (Patent), 3:44025
COLD PLASMA/NONLINEAR PROBLEMS
Space-time approach to the Vlasov-Poisson equations, 3:46043
COLD PLASMA/ONE-DIMENSIONAL CALCULATIONS
Space-time approach to the Vlasov-Poisson equations, 3:46043
COLD PLASMA/PARAMETRIC INSTABILITIES
Modulational instability and nonlinear waves in a cold plasma, 3:46026
COLD PLASMA/PLASMA WAVES
Space-time approach to the Vlasov-Poisson equations, 3:46043

COLLECTRONS
See SELF-POWERED NEUTRON DETECTORS
COLLIERIES
See COAL MINES
COLLISIONAL PLASMA/ELECTRIC CURRENTS
Neoclassical current in a toroidally-confined multispecies plasma, 3:45953
COLLISIONAL PLASMA/HEAT FLUX
Heat flux reduction by electromagnetic instabilities, 3:46002
COLLISIONAL PLASMA/KINK INSTABILITY
Transition to the electron tearing mode, 3:46027
COLLISIONAL PLASMA/NONLINEAR PROBLEMS
Nonlinear heat and particle transport due to collisional drift waves, 3:45950 (N-77-33996)
COLLISIONAL PLASMA/PLASMA MICROINSTABILITIES
Heat flux reduction by electromagnetic instabilities, 3:46002
COLLISIONAL PLASMA/TRANSPORT THEORY
Effects of high-frequency fields on plasma transport coefficients, 3:45954
COLLISIONLESS PLASMA/DIFFUSION
Effect of alternating electric fields on the diffusion of collisionless plasma in the Saturn stellarator, 3:45939
COLLISIONLESS PLASMA/ENERGY SPECTRA
Measurements of the ion energy spectrum in a collisionless neutral current sheet, 3:45942
COLLISIONLESS PLASMA/ION ACOUSTIC WAVES
Excitation of an ion-acoustic soliton by high-frequency waves in a collisionless plasma with a two-temperature electron gas, 3:46066
COLORADO/NATURAL GAS WELLS
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
COLORADO/OIL SHALE DEPOSITS
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976-October 31, 1977. Volume I, 3:44204 (TID-28053/1)
COLORADO/TERRESTRIAL ECOSYSTEMS
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976-October 31, 1977. Volume II, 3:44205 (TID-28053/2)
COLORADO/URANIUM DEPOSITS
Geochemical interpretation of ore zonation at the Rifle vanadium mine, Colorado, 3:44226 (USGS-CIRC-753)
Surface geophysical methods applied to uranium exploration in crystalline terranes, 3:44238 (USGS-CIRC-753)
Theory for the origin of the Rifle-Garfield vanadium-uranium deposit, 3:44239 (USGS-CIRC-753)
Total-field magnetic surveying as an exploration tool for sedimentary uranium deposits, 3:44242 (USGS-CIRC-753)
Uranium exploration using helium detection: a case study, 3:44225 (USGS-CIRC-753)
COLORADO/URANIUM MINES
Geochemical prospecting at the Ladwig uranium mine, near Golden, Colorado, 3:44232 (USGS-CIRC-753)
COLUMBIUM
See NIOBIUM
COMBINED-CYCLE POWER PLANTS/COMBUSTORS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
COMBINED-CYCLE POWER PLANTS/DEMONSTRATION PLANTS
U.S. utility to experiment with fluidised bed, 3:44138
COMBINED-CYCLE POWER PLANTS/DESIGN
Overall Plant Design Description (OPDD), low-Btu CO gas electric power plant (504 MW output), 3:44607 (FE-1806-23)
COMBINED-CYCLE POWER PLANTS/GAS TURBINES
High temperature turbine technology program: Phase I. Topical report. Phase III preliminary turbine sub-system technology readiness verification program plan, 3:44616 (FE-2291-12)
COMBINED-CYCLE POWER PLANTS/TECHNOLOGY ASSESSMENT
Advanced processes for generation of electric power: solvent refining of coal and combined cycle plants, 3:44072 (CONF-7710101-11)
COMBUSTION
See also FLUIDIZED-BED COMBUSTION
IN-SITU COMBUSTION
COMBUSTION/AIR POLLUTION
CO_2 risk. Change in climate by increasing combustion within the next decades, 3:45309
COMBUSTORS
See also CATALYTIC COMBUSTORS
COMBUSTORS/DESIGN
Evaluation of technical feasibility of closed cycle non-equilibrium MHD power generation with direct coal firing. 1st quarterly report, April 1-June 30, 1976, 3:44900 (FE-2238-1)
COMMERCIAL BUILDINGS/LIGHTING SYSTEMS
Illumination also needs energy. Measures for rational and economical uses of illumination energy, 3:44950
COMMERCIAL BUILDINGS/SOLAR COOLING SYSTEMS
Labor costs associated with solar equipment installation for commercial buildings, 3:44438 (CONF-761220-)
COMMERCIAL BUILDINGS/SOLAR HEATING SYSTEMS
Labor costs associated with solar equipment installation for commercial buildings, 3:44438 (CONF-761220-)
COMMERCIAL BUILDINGS/VENTILATION SYSTEMS
Design of a mobile laboratory for ventilation studies and indoor air pollution monitoring, 3:44938 (LBL-7817)
COMMERCIAL SECTOR/APPLIANCES
Electric Utility Rate Design Study: technology for utilizing off-peak energy, Topic 8, 3:44889 (NP-22552)
COMMERCIAL SECTOR/ENERGY DEMAND
Analysis of the final energy demand in individual demand sectors and projection of its future development (German Federal Republic), 3:44881
COMMUNITIES
Comparison of oiled and unoiled intertidal communities in Chedabucto Bay, Nova Scotia, 3:45410
COMPOSITE MODELS
See also PARTON MODEL
COMPOSITE MODELS/PARTICLE RAPIDITY
Composite model of mesons in relativistic configuration space, 3:45674
COMPOSITE MODELS/QUASIPOTENTIAL EQUATION
Composite model of mesons in relativistic configuration space, 3:45674
COMPOUND NUCLEI/GYROMAGNETIC RATIO
Moments of inertia and gyromagnetic ratios of compound states, 3:45784
COMPOUND NUCLEI/MOMENT OF INERTIA
Moments of inertia and gyromagnetic ratios of compound states, 3:45784
COMPOUND PARABOLIC CONCENTRATORS
See also PARABOLIC REFLECTORS
COMPOUND PARABOLIC CONCENTRATORS/EFFICIENCY
Yes: an industrial focusing non-tracking collector will work in Northeastern Ohio, 3:44493 (CONF-761220-)
COMPOUND-NUCLEUS REACTIONS/NUCLEAR REACTION KINETICS
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
COMPOUNDS (ORGANIC)
See ORGANIC COMPOUNDS
COMPRESSED AIR ENERGY STORAGE EQUIPMENT/GAS TURBINES
Parametric study of turbine systems for compressed air energy storage plants, 3:44836 (ANL/ES-64)
COMPUTER AXIAL TOMOGRAPHY SCANNING
See CAT SCANNING
COMPUTER CODES
See also TRANSLATORS
COMPUTER CODES/C CODES
COCO: a computer program for seismic analysis of a single column of the HTGR core, 3:44805 (GA-A-14600)
CONIFERS: a neutronics code for reactors with channels, 3:44730 (AECL-5305)
COMPUTER CODES/D CODES
Codes for Dijkstra's shortest path algorithm (DKSTR, SDKSTR, and USDKST, for CDC 6600), 3:46139 (SAND-78-0493)
Data Director system manual, 3:46142 (UCID-17749)
Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron (Cross sections, neutron and gamma spectra), 3:45718
COMPUTER CODES/F CODES
Examination on neutron shielding for a spent fuel shipping cask (FLASK and PALLAS-2D-CY Codes), 3:45154
COMPUTER CODES/G CODES
Gassim. user's description: a gas reservoir simulation model, 3:44192 (N-77-33467)
GAUSSIAN 76: an ab initio molecular orbital program, 3:45544 (BNL-24136)
COMPUTER CODES/I CODES
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
COMPUTER CODES/P CODES
Examination on neutron shielding for a spent fuel shipping cask (FLASK and PALLAS-2D-CY Codes), 3:45154
COMPUTER CODES/R CODES
Evaluation of the General Atomic codes TAP and RECA for HTGR accident analyses, 3:44809 (ORNL/NUREG/TM-178)

COMPUTER CODES/S CODES
Codes for Dijkstra's shortest path algorithm (DKSTR, SDKSTR, and USDKST, for CDC 6600), 3:46139 (SAND-78-0493)
Overview and market penetration methodology of a computer simulation model for projecting solar energy utilization (SPURR code), 3:44349
SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles, 3:44696 (KFK-2483)
COMPUTER CODES/T CODES
Evaluation of the General Atomic codes TAP and RECA for HTGR accident analyses, 3:44809 (ORNL/NUREG/TM-178)
COMPUTER CODES/U CODES
Codes for Dijkstra's shortest path algorithm (DKSTR, SDKSTR, and USDKST, for CDC 6600), 3:46139 (SAND-78-0493)
COMPUTER GRAPHICS/DATA COMPILATION
Energy-related environmental computer graphics systems in the Department of Energy Laboratories, 3:46135 (CONF-7706110-)
COMPUTER GRAPHICS/PROGRAMMING
Configurable software for satellite graphics, 3:46136 (COO-3077-148)
COMPUTER LANGUAGES
See PROGRAMMING LANGUAGES
COMPUTERS/DESIGN
Configurable software for satellite graphics, 3:46136 (COO-3077-148)
COMPUTERS/MANAGEMENT
Nine-fold way: a tutorial in successful performance management, 3:46138 (LBL-7256)
CONCENTRATING COLLECTORS
See also PARABOLIC COLLECTORS
CONCENTRATING COLLECTORS/CONFIGURATION
Design and operational evaluation of a non-tracking solar concentrator (Winston-type), 3:44490 (CONF-761220-)
Solar collector based on an array of lineard Clipped-V channels, 3:44489 (CONF-761220-)
Solar ladder (Patent), 3:44506
CONCENTRATING COLLECTORS/DESIGN
Discussion of a planar, Fresnel reflector, rotatable facet concentrator, 3:44491 (CONF-761220-)
Method and apparatus for heating a fluid medium by means of solar energy (Patent), 3:44521
Moderately concentrating solar collector, 3:44494 (CONF-761220-)
Portable linear-focused solar thermal energy collecting system (Patent), 3:44549
Process of and apparatus for solar heating and the like (Patent), 3:44444
Solar concentrator and energy collection system (Patent), 3:44529
Solar energy collecting apparatus (Patent), 3:44527
Solar energy collector (Patent), 3:44508
Transmission solar focusing collector, 3:44552
Vacuum tube vee-trough collector for solar heating and air conditioning applications, 3:44487 (CONF-761220-)
Wide angle solar heat collection system (Patent), 3:44544
CONCENTRATING COLLECTORS/EFFICIENCY
Moderately concentrating solar collector, 3:44494 (CONF-761220-)
Yes: an industrial focusing non-tracking collector will work in Northeastern Ohio, 3:44493 (CONF-761220-)
CONCENTRATING COLLECTORS/TESTING
Design and operational evaluation of a non-tracking solar concentrator (Winston-type), 3:44490 (CONF-761220-)
CONCRETE-PLASTIC COMPOSITES/ECONOMIC ANALYSIS
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL-50777)
CONCRETE-PLASTIC COMPOSITES/MATERIALS TESTING
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL-50777)
CONCRETES/DECOMPOSITION
Light water reactor safety research program. Quarterly report, July-September 1977 (Corium-concrete interactions; vapor explosions), 3:44810 (SAND-78-0076)
CONCRETES/INSTALLATION
Econocrete. Preprint 2845, 3:44956 (CONF-770448-3)
CONCRETES/MECHANICAL PROPERTIES
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
CONCRETES/PERFORMANCE
Econocrete. Preprint 2845, 3:44956 (CONF-770448-3)
CONCRETES/RECYCLING
Econocrete. Preprint 2845, 3:44956 (CONF-770448-3)
CONCRETES/STRESS ANALYSIS
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
CONDENSATION CHAMBERS/STRESSES
Small-scale modeling of vertical loads for the boiling-water-reactor pressure-suppression system, 3:44816 (UCRL-50016-78-1)
CONSERVATION (RESOURCE)
See RESOURCE CONSERVATION
CONSUMER PRODUCTS
Solar cigarette lighter (Patent), 3:44472
CONTAINERS
See also PRESSURE VESSELS
TANKS
CONTAINERS/DYNAMIC LOADS
Cargo response to railcar impact and tiedown load analysis, 3:45152 (LA-UR-78-1210)
CONTAINMENT SHELLS
Subatmospheric double containment system (Patent), 3:44823
CONTAINMENT SHELLS/LINERS
Leakage effects on LMFBR cell liners, 3:44813 (SAND-78-0742C)
CONTAINMENT SHELLS/REACTOR COOLING SYSTEMS
Leakage effects on LMFBR cell liners, 3:44813 (SAND-78-0742C)
CONTAINMENT SYSTEMS/PRESSURE GRADIENTS
Containment Atmosphere Response (CAR) program status report (HTGR), 3:44806 (GA-A-14699)
CONTAINMENT SYSTEMS/PRESSURE SUPPRESSION
Computer simulations of a 1/5-scale experiment of a Mark I boiler water reactor pressure-suppression system under hypothetical LOCA conditions, 3:44815 (UCID-17782)
CONTAMINATION (INTERNAL)
See RADIONUCLIDE KINETICS
CONTINENTAL SHELF/AQUATIC ECOSYSTEMS
Recommendations for microbiological studies in the Continental Shelf Areas. Results from two workshops convened 10-11 August 1976 and 19-20 October 1976 in Boulder, Colorado. Outer Continental Shelf environmental assessment program. Technical memo, 3:44143 (PB-274660)
CONTINUOUS MINERS/PERFORMANCE TESTING
Deep cutting continuous miner. (effect of drum rotational speed and depth of cut on airborne respirable dust and specific energy). Final report, January 1972-December 1976, 3:44097 (PB-274345)
CONTROL ELEMENTS/REACTIVITY WORTHS
Evaluation of the neutron flux-depression factor via the integral transform method, 3:45819
CONTROL ROD EFFECTIVENESS
See CONTROL ROD WORTHS
CONTROL ROD WORTHS
Adjuster rod experiments in ZED-2, 3:44674 (AECL-5853)
CONTROL RODS
See CONTROL ELEMENTS
CONTROL SYSTEMS
(For automated processes including feedback.)
See also REACTOR CONTROL SYSTEMS
Vertical axis wind turbines (Patent), 3:44603
CONTROL THEORY (REACTOR)
See REACTOR KINETICS
CONVEYORS/AUTOMATION
Electrical equipment for roller conveyors, 3:44102
COOLERS
See HEAT EXCHANGERS
COOLING SYSTEM (REACTOR)
See REACTOR COOLING SYSTEMS
COOLING SYSTEMS
See also REACTOR COOLING SYSTEMS
COOLING SYSTEMS/DESICCANTS
Desiccant systems potential for cooling in humid climates, 3:44426 (CONF-761220-)
COOLING SYSTEMS/INTAKE STRUCTURES
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
COOLING SYSTEMS/PERFORMANCE
Experimental study of bank aerodynamics of atmospheric spray cooling systems, 3:44611 (COO-4531-1)
COOLING TOWERS/ENVIRONMENTAL EFFECTS
Large wet-type cooling towers and their influence on the environment, 3:44612
COPPER/ADSORPTION
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
COPPER/ARGON 40 REACTIONS
Spallation of copper by 80-GeV ^{40}Ar Ions, 3:45733
COPPER/BIOLOGICAL EFFECTS
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
COPPER/CHARGED-PARTICLE TRANSPORT
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812

COPPER/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
COPPER/CRYOGENIC CABLES
High-conductivity high-specific-heat copper for cryogenic applications, 3:45142
COPPER/ECOLOGICAL CONCENTRATION
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID-17744-78-2)
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
Investigations of heavy metals and other persistent chemicals, Westernport Bay, Australia (Zn, Cu, and Cd in oysters), 3:45349
COPPER/ELECTRONIC STRUCTURE
Bonding in a Cu (001) monolayer, 3:45025
COPPER/ENVIRONMENTAL TRANSPORT
Relationship between content of copper in fish, plankton, and lake water, 3:47337 (UCRL-Trans-11369)
COPPER/ION-ATOM COLLISIONS
Target-thickness dependence of radiative electron capture in heavy-ion collisions, 3:45529
COPPER/PARTITION FUNCTIONS
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID-17744-78-2)
COPPER/PHYSICAL RADIATION EFFECTS
Excited state formed by B^+ impact on metallic Cu and Mo, 3:45058
COPPER/PION MINUS REACTIONS
Production of J/Psi particles by 43-GeV/c π^- mesons on the nuclei Be, Cu, and W, 3:45586
COPPER/SURFACES
LEED analysis of a Cu(110) surface, 3:45011
COPPER/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID-17744-78-2)
COPPER/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
COPPER 61/BETA-PLUS DECAY
Multiparticle configurations in the odd-neutron nuclei ^{61}Ni and ^{67}Zn populated by decay of ^{61}Cu, ^{67}Cu, and ^{67}Ga, 3:45730
COPPER 61/ENERGY LEVELS
Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu (Wood-Saxon and Nilsson potentials, spin-cutoff parameters, m value, π, J, partition function inversion), 3:45717
COPPER 63/ENERGY LEVELS
Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu (Wood-Saxon and Nilsson potentials, spin-cutoff parameters, m value, π, J, partition function inversion), 3:45717
COPPER 63 TARGET/NEUTRON REACTIONS
Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
COPPER 65/ENERGY LEVELS
Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu (Wood-Saxon and Nilsson potentials, spin-cutoff parameters, m value, π, J, partition function inversion), 3:45717
COPPER 65/ENERGY-LEVEL TRANSITIONS
Scattering of high energy electrons by ^{65}Cu, 3:45736
COPPER 65 TARGET/ELECTRON REACTIONS
Scattering of high energy electrons by ^{65}Cu, 3:45736
COPPER 67/BETA-MINUS DECAY
Multiparticle configurations in the odd-neutron nuclei ^{61}Ni and ^{67}Zn populated by decay of ^{61}Cu, ^{67}Cu, and ^{67}Ga, 3:45730
COPPER ALLOYS
See also COPPER BASE ALLOYS
COPPER ALLOYS/ENERGY SPECTRA
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
COPPER ALLOYS/OPTICAL PROPERTIES
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
COPPER BASE ALLOYS/PERMEABILITY
Hydrogen and deuterium permeation in copper alloys, copper-gold brazing alloys, gold, and the in situ growth of stable oxide permeation barriers, 3:45027
COPPER BASE ALLOYS/SUPERCONDUCTIVITY
Superconducting properties of in situ prepared Nb-Cu-Sn alloys, 3:45021
COPPER ORES/MILLING
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
COPPER ORES/MINING
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
COPPER OXIDES/INFRARED SPECTRA
Resonance Raman studies in Cu_2O. II. The yellow and green excitonic series, 3:45092
COPPER OXIDES/RAMAN SPECTRA
Resonance Raman studies in Cu_2O. II. The yellow and green excitonic series, 3:45092
COPPER SELENIDES/CHEMICAL COMPOSITION
Auger electron spectroscopy studies of I-III-VI_2 chalcopyrite compounds, 3:45114
COPPER SULFIDES/CHEMICAL COMPOSITION
Auger electron spectroscopy studies of I-III-VI_2 chalcopyrite compounds, 3:45114
COPPER TELLURIDES/CHEMICAL COMPOSITION
Auger electron spectroscopy studies of I-III-VI_2 chalcopyrite compounds, 3:45114
CORIUM/HEAT TRANSFER
Growth of molten core debris pools in concrete. Progress report, March 1, 1977-November 30, 1977 (LMFBR), 3:44800 (COO-4261-4)
CORONA (SOLAR)
See SOLAR CORONA
CORTISOL
See HYDROCORTISONE
COSMIC PARTICLES
See COSMIC RADIATION
COSMIC RADIATION/COSMIC RAY DETECTION
Fiftieth anniversary of a fundamental discovery in cosmic-ray physics, 3:45438
COSMIC RAY DETECTION/REVIEWS
Fiftieth anniversary of a fundamental discovery in cosmic-ray physics, 3:45438
COSMOLOGICAL MODELS/SPACE-TIME
Relativity of space and time finiteness-infiniteness for a matter-filled universe, 3:45470
Relativity of space finiteness-infiniteness for some Friedmann cosmological models, 3:45471
COSMOLOGY/BLACK HOLES
Gravitation, charges, cosmology, and coherence, 3:45472
COSMOS
See UNIVERSE
COSTA RICA/ELECTRICAL SURVEYS
Guanacaste Geothermal Project. Technical prefeasibility report. Annex C. Electric resistivity, 3:44581 (NP-23012)
COSTA RICA/GEOCHEMICAL SURVEYS
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP-23013)
COSTA RICA/GEOLOGICAL SURVEYS
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP-22850)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex E. Geohydrology, 3:44576 (NP-23011)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex A. Geology, 3:44577 (NP-23014)
COSTA RICA/GEOLOGY
Guanacaste Geothermal Project. Technical prefeasibility report. Annex E. Geohydrology, 3:44576 (NP-23011)
COSTA RICA/GEOPHYSICAL SURVEYS
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP-22850)
COSTA RICA/GEOTHERMAL EXPLORATION
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP-22850)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex E. Geohydrology, 3:44576 (NP-23011)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex A. Geology, 3:44577 (NP-23014)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex C. Electric resistivity, 3:44581 (NP-23012)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex F. Heat flow, 3:44582 (NP-23015)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex D. Gravimetry, 3:44583 (NP-23016)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP-23013)
COSTA RICA/GRAVITY SURVEYS
Guanacaste Geothermal Project. Technical prefeasibility report. Annex D. Gravimetry, 3:44583 (NP-23016)

COSTA RICA/HEAT FLOW
Guanacaste Geothermal Project. Technical prefeasibility report. Annex F. Heat flow, 3:44582 (NP-23015)
COSTA RICA/HYDROLOGY
Guanacaste Geothermal Project. Technical prefeasibility report. Annex E. Geohydrology, 3:44576 (NP-23011)
COSTA RICA/MAPS
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP-22850)
COUPLED CHANNEL BORN APPROXIMATION/OXYGEN 16 REACTIONS
$^{16}O + {}^{40}Ca$ inelastic scattering and direct-reaction calculations in heavy-ion scattering, 3:45725
COUPLED CHANNEL THEORY/ANNIHILATION
Annihilation widths and shifts of quasinuclear NN-bar levels in the coupled-channel model, 3:45856
COUPLED FAST REACTOR MEASUREMENT FACILITY
See CFRMF REACTOR
CP INVARIANCE/GAUGE INVARIANCE
CP violation in left-right-symmetric gauge theories and possible existence of absolutely stable hadrons, 3:45650
CP-2 REACTOR/RADIATION MONITORING
Formerly utilized MED/AEC sites remedial action program. Radiological survey of site A, Palos Park Forest Preserve, Chicago. Final report, 3:44301 (DOE/EV-0005/7)
CP-3 REACTOR/RADIATION MONITORING
Formerly utilized MED/AEC sites remedial action program. Radiological survey of site A, Palos Park Forest Preserve, Chicago. Final report, 3:44301 (DOE/EV-0005/7)
CRABS
See CRUSTACEANS
CRACKING
See also CATALYTIC CRACKING
CRACKING/CATALYSTS
Microspheres containing Nay zeolite synthesized from a South African kaolinite. (Precursor for a fluidized bed cracking catalyst), 3:44158 (PB-274450)
CRATERS/SIMULATION
Two-dimensional computer simulation of hypervelocity impact cratering: some preliminary results for Meteor Crater, Arizona, 3:45433 (UCRL-80539)
CRBR REACTOR
See CLINCH RIVER BREEDER REACTOR
CREEKS
See RIVERS
CROPS/SOLAR DRYING
Possibilities of using solar energy in dryers for agricultural products, 3:44458
Solar technology in agriculture, 3:44459
CRUDE OIL
See PETROLEUM
CRUSTACEANS
See also ZOOPLANKTON
Long-term effects of an oil spill on population of the salt-marsh crab Uca pugnax, 3:45414
CRUSTACEANS/GROWTH
Effects of chronic exposure to petroleum upon the growth and molting of juveniles of the arctic marine isopod crustacean Mesidotea entomon, 3:45415
CRYOSTATS/DESIGN
Apparatus for the infrared spectroscopic study of solids at high pressures (12 kbars) and low temperatures (4.2°K and 2°K), 3:45099 (UCRL-Trans-11353)
CRYOSTATS/PERFORMANCE
Apparatus for the infrared spectroscopic study of solids at high pressures (12 kbars) and low temperatures (4.2°K and 2°K), 3:45099 (UCRL-Trans-11353)
CT SCANNING
See CAT SCANNING
CURIUM 246 TARGET/DEUTERON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CURIUM 246 TARGET/PROTON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CURIUM 246 TARGET/TRITON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CURIUM 248 TARGET/DEUTERON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CURIUM 248 TARGET/PROTON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CURIUM 248 TARGET/TRITON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
CUTTER LOADERS
See also CONTINUOUS MINERS
CUTTER LOADERS/AUTOMATION
Electrical equipment for roller conveyors, 3:44102
CUTTER LOADERS/ELECTRICAL EQUIPMENT
Electrical equipment for roller conveyors, 3:44102
CUTTER LOADERS/MACHINE PARTS
Roller cutting machine (Patent), 3:44107
CYCLIC ADENOSINE MONOPHOSPHATE
See AMP
CYCLOHEXANE/ADSORPTION ISOTHERMS
Adsorption of vapors of organic substances on coal, 3:44078
CYCLONE SEPARATORS/AIR SAMPLERS
Large-volume sampler for submicroscopic aerosol particles, 3:45239
CYTOCHROMES/BIOSYNTHESIS
Chromosomal translocation causing overproduction of iso-2-cytochrome c in yeast, 3:45373
CZECHOSLOVAKIA/AQUATIC ECOSYSTEMS
Relationship between content of copper in fish, plankton, and lake water, 3:45337 (UCRL-Trans-11369)

D

D-1865 RESONANCES/LEPTONIC DECAY
Kaon-electron correlations in the semileptonic decays of D mesons, 3:45613
D-1865 RESONANCES/PARTICLE PRODUCTION
Kaon-electron correlations in the semileptonic decays of D mesons, 3:45613
DC TO DC CONVERTERS/COMPUTER-AIDED DESIGN
User's manual: computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters, 3:44835 (N-77-33602)
DDT
(Dichlorodiphenyltrichloroethane.)
DDT/ENVIRONMENTAL EFFECTS
Distribution of mercury in fish and its form of occurrence, 3:45348
DDT/TOXICITY
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
DECAY/MATHEMATICAL MODELS
Comments on alternate formulations for preequilibrium decay, 3:45795
DEEP INELASTIC SCATTERING/NUCLEON-NUCLEON INTERACTIONS
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
DEEP INELASTIC SCATTERING/VECTOR DOMINANCE MODEL
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
DEFORMED NUCLEI/BOSONS
Boson approximation in deformed atomic nuclei, 3:45785
DEFORMED NUCLEI/EXCITATION
Translational invariance effects in octupole excitations of deformed nuclei, 3:45694
DEFORMED NUCLEI/GYROMAGNETIC RATIO
Moments of inertia and gyromagnetic ratios of compound states, 3:45784
DEFORMED NUCLEI/MOMENT OF INERTIA
Moments of inertia and gyromagnetic ratios of compound states, 3:45784
DEFORMED NUCLEI/SELF-CONSISTENT FIELD
Boson approximation in deformed atomic nuclei, 3:45785
DEGRADATION (NUCLEAR)
See DECAY
DEHUMIDIFIERS/ENERGY EFFICIENCY
Energy efficiency program for room air conditioners, central air conditioners, dehumidifiers, and heat pumps, 3:44926 (SAI-77-858-LJ)
DEHUMIDIFIERS/EVALUATION
Solar-powered dehumidification, 3:44424 (CONF-761220-)
DEHYDROGENASES/BIOSYNTHESIS
Hormonal effects on differentiation in neutral cultures (Rats), 3:45371 (UCLA-12-1144)
DEHYDROGENASES/METABOLISM
Hormonal effects on differentiation in neutral cultures (Rats), 3:45371 (UCLA-12-1144)
DEOXYPENTOSE NUCLEIC ACID
See DNA

DEOXYRIBONUCLEIC ACID
See DNA
DEPRESSURIZATION/PRESSURE GRADIENTS
Containment Atmosphere Response (CAR) program status report (HTGR), 3:44806 (GA-A-14699)
DESOXYRIBONUCLEIC ACID
See DNA
DESULFURIZATION/CATALYSTS
Process for improved carbon-supported hydrodesulfurization catalysts (Patent), 3:44159
DETERGENTS/ENVIRONMENTAL IMPACTS
Control of volatile organic emissions from solvent metal cleaning, 3:45322 (PB-274557)
DETERGENTS/TOXICITY
Recolonization of rocky shores in Cornwall after use of toxic dispersants to clean up the Torrey Canyon spill, 3:44180
DETONATION WAVES
See SHOCK WAVES
DEUTERIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
DEUTERIUM/CRYOPUMPS
Cryosorption pumping of deuterium by MS-5A at temperatures above 4.2 K for fusion reactor applications, 3:46131
DEUTERIUM/DIFFUSION
Hydrogen and deuterium permeation in copper alloys, copper-gold brazing alloys, gold, and the in situ growth of stable oxide permeation barriers, 3:45027
SIMS analysis of deuterium diffusion in hydrogenated amorphous silicon, 3:45088
DEUTERIUM/ISOTOPE RATIO
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
Natural gases in the south German Molasse Basin. Application of D/H and $^{13}C/^{12}C$ isotope analyses to deduce their origin, 3:44194
DEUTERIUM/PLASMA EXPANSION
Optimum parameters of a dense freely expanding deuterium-tritium plasma, 3:45972
DEUTERIUM COMPOUNDS/RAMAN SPECTRA
Raman studies of hydrogen vibrational modes in palladium, 3:45118 (COO-1198-1212)
DEUTERIUM IONS/BEAM PRODUCTION
Production of polarized H^- or D^- ions by a colliding-beam method, 3:45502
DEUTERIUM TARGET/DEUTERON REACTIONS
Microscopic K-matrix approach to the continuous spectrum in the four-nucleon problem, 3:45787
DEUTERIUM TARGET/ELECTRON REACTIONS
Parity violation in atoms induced by radiative corrections, 3:45614
DEUTERIUM TARGET/NEUTRON REACTIONS
Sum rules for elastic nd scattering, 3:45686
DEUTERIUM TARGET/PION REACTIONS
$\pi^+ + d \rightarrow p + p$ reaction at 40, 50, and 60 MeV, 3:45689
DEUTERON REACTIONS/BACKSCATTERING
Microscopic K-matrix approach to the continuous spectrum in the four-nucleon problem, 3:45787
DEUTERON REACTIONS/ELASTIC SCATTERING
Effect of breakup on the spin dependence of the deuteron-nucleus interaction, 3:45728
DEUTERON REACTIONS/FISSION
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
DEUTERON REACTIONS/INELASTIC SCATTERING
Contribution of inelastic rescattering to cumulative meson production, 3:45644
DEUTERON REACTIONS/PICKUP REACTIONS
States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
DEUTERON REACTIONS/RESCATTERING
Contribution of inelastic rescattering to cumulative meson production, 3:45644
DEUTERON REACTIONS/STRIPPING
Energy levels of ^{239}U observed with the (d,p) reaction, 3:45769
States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
DEUTERONS/MAGNETIC MOMENTS
NMR determination of the triton-proton magnetic moment ratio to within 10^{-6}%, 3:45517
DEVELOPING COUNTRIES/ECONOMIC DEVELOPMENT
Relation between energy - ecology - economy. An investigation with examples from Brazil and other Third World countries, 3:44858
DEVELOPING COUNTRIES/ECONOMICS
Global environment, 3:45329 (NP-23191)
DEVELOPING COUNTRIES/NUCLEAR POWER
IAEA nuclear power forecast for developing countries, 3:44718 (CONF-760688-)
DEVELOPING COUNTRIES/SOLAR ENERGY
Use of solar energy equipment in developing countries as an example for a 'soft technology' and the possibilities for its promotion, 3:44343
DEVELOPING COUNTRIES/SOLAR THERMAL POWER PLANTS
Method for comparing solar energy power systems for developing countries, 3:44397
DIAMOND DRILLING EQUIPMENT
See DRILLING EQUIPMENT
DIAPHRAGMS (THERMONUCLEAR DEVICE)
See LIMITERS
DICHLORODIPHENYLTRICHLOROETHANE
See DDT
DIELDRIN/TOXICITY
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
DIELECTRIC MATERIALS
See also FERROELECTRIC MATERIALS
DIELECTRIC MATERIALS/ELECTROSTATICS
Contact electrification of dielectric solids, 3:45085 (AED-Conf-1977-197-009)
DIELECTRIC MATERIALS/SHOCK WAVES
Electrical response of relaxing dielectrics compressed by shock waves: The axial-mode problem, 3:44915
DIELECTRICS
See DIELECTRIC MATERIALS
DIFFERENTIAL EQUATIONS
See also DIRAC EQUATION
POISSON EQUATION
SCHROEDINGER EQUATION
DIFFERENTIAL EQUATIONS/EIGENFUNCTIONS
Solution of a second-order integro-differential equation which occurs in laser modelocking, 3:45867
DIFFERENTIAL EQUATIONS/NUMERICAL SOLUTION
Block implicit one-step methods, 3:46143
High order finite element method for the calculation of capillary surfaces (Young-Laplace equation), 3:45866 (LBL-7291)
Storage reduction for Runge-Kutta codes, 3:46140 (SAND-78-0909)
2-2-DIMETHYLPROPANE/ELECTRON MOBILITY
Correspondence of conduction band minima and electron mobility maxima in dielectric liquids, 3:44999
DIRAC EQUATION/INSTANTONS
Local supersymmetry transformations and fermion solutions in the presence of instantons, 3:45667
DIRAC EQUATION/SYMMETRY
Local supersymmetry transformations and fermion solutions in the presence of instantons, 3:45667
DIRAC MONOPOLES
See MAGNETIC MONOPOLES
DISEASES
See also NEOPLASMS
NERVOUS SYSTEM DISEASES
RESPIRATORY SYSTEM DISEASES
SKIN DISEASES
UROGENITAL SYSTEM DISEASES
DISEASES/RADIOTHERAPY
Review of the use of ionizing radiation for the treatment of benign diseases. Volume I. Committee's report. Final report, 3:45380 (PB-274032)
DISPLAY DEVICES/DESIGN
Halftone display, particularly for a high resolution radioactivity distribution detection system, 3:45260
DISTANCE/COMPUTER CODES
Codes for Dijkstra's shortest path algorithm, 3:46139 (SAND-78-0493)
DISTRICT HEATING/PLANNING
Use of nuclear energy for district heating, 3:44728
DIVERTORS
Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub-7117/25)
DNA
(Deoxyribonucleic acid.)
DNA/BIOLOGICAL RADIATION EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (X and gamma radiation, electrons, negative pions), 3:45398 (STI/PUB-441(Vol.1))
DOLOMITE/EVALUATION
Supportive studies in fluidized-bed combustion. Quarterly report, July-September 1977, 3:44131 (ANL/CEN/FE-77-8)

DOMESTIC ANIMALS/POLLUTION
Distribution of mercury in fish and its form of occurrence, 3:45348
DOSE EQUIVALENTS
Radiological protection. First European symposium on rad-equivalence, 3:45400
DOUBLET REACTORS/PLASMA DIAGNOSTICS
Dual laser interferometer for plasma density measurements on large tokamaks, 3:45910
DOUGLAS POINT ONTARIO REACTOR/CONVERSION RATIO
Measurement of a relative conversion ratio in 19-element ThO_2-UO_2 fuel, 3:44670 (AECL-5825)
DOUGLAS POINT POWER STATION
See DOUGLAS POINT ONTARIO REACTOR
DRIFT INSTABILITY
Gradient B drift instability in toroidal systems, 3:46030
DRIFT INSTABILITY/DISPERSION RELATIONS
Density gradient drift instabilities: Oblique propagation at zero beta, 3:45999
Toroidal mode coupling effects on drift wave stability, 3:45994
DRIFT INSTABILITY/QUASILINEAR PROBLEMS
Low-frequency microinstabilities in the PLT tokamak, 3:45884
Particle simulation studies of the lower hybrid drift instability, 3:46005
DRIFT INSTABILITY/SHEAR
Influence of magnetic shear on the lower-hybrid-drift instability in toroidal reversed-field pinches, 3:46003
DRIFT INSTABILITY/STABILIZATION
Quasi-linear stabilization of lower-hybrid-drift instability, 3:45995
DRILLING EQUIPMENT
See also DRILLS
DRILLING EQUIPMENT/ELECTRICAL SURVEYS
Fossil Energy Development Programs. Quarterly report, October 1-December 31, 1977, 3:44052 (SAND-78-0653)
DRILLING FLUIDS/WASTE STORAGE
Jurisdiction and mining administration. Immediate enforcebility of an approved operation plan (German Federal Republic), 3:44187
DRILLING MUD
See DRILLING FLUIDS
DRILLS
See also DRILLING EQUIPMENT
ROCK DRILLING
WELL DRILLING
DRILLS/DESIGN
Design of a quiet rock drill. A feasibility study using principles of leavell pavement breaker. Final report, 3:44099 (PB-274402)
DRINKING WATER/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
DRUGS
See also RADIOPHARMACEUTICALS
DRUGS/RADIOSENSITIVITY EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (X and gamma radiation, electrons, negative pions), 3:45398 (STI/PUB-441(Vol.1))
D-T REACTORS/ENERGY LOSSES
Tamper temperature and compression from simultaneous proton and alpha-particle measurements in laser fusion experiments, 3:45906
DUAL-PURPOSE POWER PLANTS
Simultaneous generation of heat and electricity, 3:44394 (CONF-761220-)
DUCTS/NEUTRON TRANSPORT
Neutrons streaming through conical ducts, 3:45822
DUST COLLECTORS/SPECIFICATIONS
Installations and methods for dust control and dust samplers, 3:45238
DUSTS/CONTROL
Use of polymer solution for consolidation of coal seams, 3:44140
DUSTS/FILTRATION
Performance of a pulse jet filter at high filtration velocity. III. Penetration by fault processes (Effect of by-pass leaks and methods of detection), 3:45240
DYE LASERS/OPTICAL PUMPING
Some ways of improving the energy characteristics of lamp-pumped dye-solution lasers, 3:45192
Spatial coherence of the emission of a rhodamine-6G water-solution laser in an unstable cavity with lamp pumping, 3:45198
DYE LASERS/PERFORMANCE
Some ways of improving the energy characteristics of lamp-pumped dye-solution lasers, 3:45192
DYE LASERS/WAVELENGTHS
Organic-dye attachment for converting the wavelength of the radiation of pulsed solid-state and gas lasers, 3:45193
DYSPROSIUM/MAGNETIZATION
Effective fields at diamagnetic impurities in rare-earth metals, 3:45051
DYSPROSIUM 162 TARGET/OXYGEN 16 REACTIONS
Coulomb-nuclear interference for high-spin states excited by ^{96}Kr, ^{40}Ar, and ^{16}O projectiles, 3:45748
DYSPROSIUM 164/ENERGY-LEVEL TRANSITIONS
Recoil-distance measurement of lifetimes of rotational states in ^{164}Dy, 3:45750
DYSPROSIUM 164/ROTATIONAL STATES
Recoil-distance measurement of lifetimes of rotational states in ^{164}Dy, 3:45750
DYSPROSIUM 164 TARGET/ARGON 40 REACTIONS
Recoil-distance measurement of lifetimes of rotational states in ^{164}Dy, 3:45750
DYSPROSIUM ALLOYS/MAGNETOSTRICTION
Effect of magnetically aligned powder on the magnetostriction of sintered rare earth-iron Laves phase compounds, 3:45022
DYSPROSIUM COMPOUNDS/EXCHANGE INTERACTIONS
Characteristics of the contribution of $Dy^{3}+$ and $Tb^{3}+$ ions to the anisotropy of Dy/sub x/Tb/sub 1-x/FeO_3 orthoferrites, 3:45098
DYSPROSIUM COMPOUNDS/MAGNETIZATION
Characteristics of the contribution of $Dy^{3}+$ and $Tb^{3}+$ ions to the anisotropy of Dy/sub x/Tb/sub 1-x/FeO_3 orthoferrites, 3:45098

E

EARTH ATMOSPHERE
See also AIR
IONOSPHERE
MAGNETOSPHERE
STRATOSPHERE
SURFACE AIR
EARTH ATMOSPHERE/AEROSOL MONITORING
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP-1469)
EARTH ATMOSPHERE/CARBON DIOXIDE
CO_2 risk. Change in climate by increasing combustion within the next decades, 3:45309
EARTH CRUST/CRATERS
Two-dimensional computer simulation of hypervelocity impact cratering: some preliminary results for Meteor Crater, Arizona, 3:45433 (UCRL-80539)
EARTH CRUST/HEAT FLOW
Geothermal energy (Heat flow calculations from mantle to crust), 3:44578 (CONF-7608107-1)
EARTH CRUST/THICKNESS
Crustal thickness in the island region of the Soviet Far East, 3:45428 (UCRL-Trans-11367)
EARTH MANTLE/HEAT FLOW
Geothermal energy (Heat flow calculations from mantle to crust), 3:44578 (CONF-7608107-1)
EARTHQUAKES
See also SEISMIC S WAVES
EARTHQUAKES/GROUND MOTION
Periods of surface waves (Criteria for identification of underground explosions based on predominant period of surface waves in comparison with earthquakes), 3:45407 (UCRL-Trans-11366)
EARTHQUAKES/MAPS
Investigation of small earthquakes in Southwestern Turkmenia, 3:45430 (UCRL-Trans-11363)
Travel time curves of seismic waves for the southern Baikal region, 3:45429 (UCRL-Trans-11368)
EARTHQUAKES/SEISMIC DETECTION
Method of isosurfaces in the interpretation of local earthquakes, 3:45431 (UCRL-Trans-11364)
EARTHWORMS
See ANNELIDS
EBR-2 REACTOR/STEAM GENERATORS
First mechanized in-service inspection of EBR-II steam generator, 3:44778 (ANL-77-46)
ECCS
(Emergency core cooling system.)
System for the emergency injection of liquid into a nuclear reactor core (Patent), 3:44652
ECCS/PERFORMANCE TESTING
SUNYAB/EPRI Combined Injection ECC Program. Interim report, 3:44802 (EPRI-NP-757)
ECONOMIC DEVELOPMENT
See also COMMERCIAL SECTOR

ECONOMIC DEVELOPMENT/ENERGY CONSUMPTION
Relation between energy - ecology - economy. An investigation with examples from Brazil and other Third World countries, 3:44858
ECONOMICS
Environmental economics, 3:45320 (NP-23191)
EFFLUENTS (CHEMICAL)
See CHEMICAL EFFLUENTS
EGR SYSTEMS
See EXHAUST RECIRCULATION SYSTEMS
EHV AC SYSTEMS/PLANNING
380 kV cable in Berlin, 3:44630 (AED-Conf-76-407-006)
EHV AC SYSTEMS/TRANSFORMERS
Prototype field calibration system for coupling capacitor voltage transformers (CCVTs). Final report, 3:44631 (EPRI-EL-690)
EHV AC SYSTEMS/UNDERGROUND POWER TRANSMISSION
380 kV cable in Berlin, 3:44630 (AED-Conf-76-407-006)
EINSTEIN GRAVITATION THEORY
See GENERAL RELATIVITY THEORY
EINSTEIN-DE SITTER MODEL
See COSMOLOGICAL MODELS
EINSTEINIUM 251/ENERGY LEVELS
Proton states in the Z = 99 nucleus ^{251}Es excited by ^{251}Fm electron capture decay and ^{250}Cf(α,t) reaction, 3:45767
ELECTRIC BATTERIES
(Devices for production and/or storage of electrical energy from chemical reactions; excludes FUEL CELLS and RADIOISOTOPE BATTERIES.)
ELECTRIC BATTERIES/ELECTROLYTES
Solid electrolyte battery materials. Final report, 1 July 1976-31 September 1977, 3:44851 (AD-A-048330)
ELECTRIC BATTERIES/RESEARCH PROGRAMS
Battery and electrochemical systems program summary, FY 1977, 3:44849 (DOE/ET-0014)
Electricity from better batteries. Developments in the field of static energy sources in Great Britain, 3:44850
ELECTRIC BRIDGES/JOSEPHSON EFFECT
Current-controlled superconductive bridge contacts, 3:45146
Transition from relaxational to "Josephson" oscillations in shunted superconducting bridges, 3:45145
ELECTRIC CABLES
See also SUPERCONDUCTING CABLES
Electrical wire for use in nuclear generating stations (Patent), 3:44763
ELECTRIC CABLES/ELECTRICAL INSULATION
Far-infrared inspection of cable insulation. Interim report, 3:44633 (EPRI-EL-738)
ELECTRIC CABLES/SAFETY
Surge behavior of UD cable systems. Final report, 3:44632 (EPRI-EL-720)
ELECTRIC CABLES/SURGES
Surge behavior of UD cable systems. Final report, 3:44632 (EPRI-EL-720)
ELECTRIC CONTACTS/JOSEPHSON EFFECT
Current-controlled superconductive bridge contacts, 3:45146
ELECTRIC HEATING/ECONOMICS
Economic significance of the use of electric heat, 3:44935
ELECTRIC POWER
See also OFF-PEAK POWER
ELECTRIC POWER/COST
Comparative electrical generation costs, 3:44717 (CONF-760688-)
ELECTRIC POWER/ECONOMICS
Lowering energy costs. A practical guide for purchase and operation, 3:44619
ELECTRIC POWER/ENGINEERING
Impact of the technological change on energy technology (In German), 3:44606 (AED-Conf-76-399-002)
ELECTRIC POWER/MHD GENERATORS
Physics of MHD generators, 3:44899
ELECTRIC POWER/PLANNING
The 1976 Alaska power survey. Volume 2, 3:44893 (PB-274081)
ELECTRIC POWER/TECHNOLOGY UTILIZATION
Impact of the technological change on energy technology (In German), 3:44606 (AED-Conf-76-399-002)
ELECTRIC RAILWAYS
See also TRAINS
ELECTRIC RAILWAYS/ELECTRIC MOTORS
New generation of locomotives with three-phase motors, 3:44970
ELECTRIC SPARKS/PLASMA DIAGNOSTICS
Photographic study of rapid events by picosecond techniques, 3:45904 (N-77-33495)
ELECTRIC UTILITIES
See PUBLIC UTILITIES
ELECTRIC UTILITIES/FINANCING
Interviews concerning topical questions in the German electricity supply industry, 3:44967
ELECTRIC UTILITIES/FORECASTING
Interviews concerning topical questions in the German electricity supply industry, 3:44967
ELECTRIC UTILITIES/RATE STRUCTURE
Electric Utility Rate Design Study: technology for utilizing off-peak energy, Topic 8, 3:44889 (NP-22552)
Electric Utility Rate Design Study: how to quantify marginal costs, a reply to Task Force 4 comments, 3:44891 (NP-22555)
Electric Utility Rate Design Study: making the transition from unit marginal costs to rates. Results for Portland General Electric Company, 3:44892 (NP-22556)
ELECTRICAL EQUIPMENT
See also DC TO DC CONVERTERS
ELECTRIC BRIDGES
ELECTRIC CONTACTS
TRANSFORMERS
Maine Yankee Atomic Power Plant. IE circular No. 78-06: potential common mode flooding of ECCS equipment rooms at BWR facilities, 3:44715 (DOCKET-50309-855)
ELECTRICAL EQUIPMENT/CLEANING
N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX-613-1955(Rev.))
ELECTRICAL EQUIPMENT/SYSTEM FAILURE ANALYSIS
Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples, 3:44812 (SAND-78-0718)
ELECTRICAL INSULATION/NONDESTRUCTIVE TESTING
Far-infrared inspection of cable insulation. Interim report, 3:44633 (EPRI-EL-738)
ELECTRICAL INSULATION/QUALITY CONTROL
Far-infrared inspection of cable insulation. Interim report, 3:44633 (EPRI-EL-738)
ELECTRICAL INSULATORS/CRACKS
Grundremmingen nuclear power plant: The accident that came from the cold, 3:44825
ELECTRICAL SURVEYS
See also ELECTROMAGNETIC SURVEYS
ELECTRICAL SURVEYS/ELECTRIC POTENTIAL
Behavior of electric potential fields over randomly layered earth models. Doctoral thesis, 3:45432 (AD-A-046975)
ELECTRICAL SURVEYS/MATHEMATICAL MODELS
Behavior of electric potential fields over randomly layered earth models. Doctoral thesis, 3:45432 (AD-A-046975)
ELECTRICAL SURVEYS/TECHNOLOGY ASSESSMENT
Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL-6815)
ELECTROMAGNETIC FIELDS/BIOLOGICAL EFFECTS
Science and life. Selected articles, 3:45426 (AD-A-048648)
Seafarer: impacts and studies of the extremely low frequency communication system (a bibliography with abstracts). Report for 1964-January 1978, 3:45425 (NTIS/PS-78/0062)
ELECTROMAGNETIC INTERACTIONS
See also ELECTROPRODUCTION
LEPTON-LEPTON INTERACTIONS
PHOTOPRODUCTION
ELECTROMAGNETIC INTERACTIONS/ALGEBRAIC CURRENTS
Generalization of the electromagnetic current operator, 3:45647
ELECTROMAGNETIC INTERACTIONS/GAUGE INVARIANCE
SU(3) x U(1) gauge theory of weak and electromagnetic interactions, 3:45601
ELECTROMAGNETIC RADIATION
See also GAMMA RADIATION
SYNCHROTRON RADIATION
X RADIATION
ELECTROMAGNETIC RADIATION/HYBRID RESONANCE
Filamentation of lower-hybrid cones, 3:46050
ELECTROMAGNETIC RADIATION/WAVE PROPAGATION
Relativistic effects on electromagnetic wave propagation in a cold inhomogeneous electron plasma, 3:46052
ELECTROMAGNETIC SURVEYS
See also ELECTRICAL SURVEYS
MAGNETOTELLURIC SURVEYS
ELECTROMAGNETIC SURVEYS/TECHNOLOGY ASSESSMENT
Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL-6815)
ELECTROMAGNETIC TESTING/TECHNOLOGY ASSESSMENT
Electromagnetic methods for inspection of ferrous tubing, 3:45222 (BN-SA-311)
ELECTRON BEAMS/MAGNETIC SHIELDING
Self-magnetic insulation in vacuum for coaxial geometry, 3:45248

ELECTRON DIFFRACTION/LATTICE VIBRATIONS
Some effects of anisotropic vibrations in LEED, 3:45837
ELECTRON DOSIMETRY/EXPERIMENT PLANNING
Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr-77-72)
ELECTRON GAS/NONLINEAR PROBLEMS
Space-time approach to the Vlasov-Poisson equations, 3:46043
ELECTRON GAS/ONE-DIMENSIONAL CALCULATIONS
Space-time approach to the Vlasov-Poisson equations, 3:46043
ELECTRON GAS/PLASMA WAVES
Space-time approach to the Vlasov-Poisson equations, 3:46043
ELECTRON GUNS/PERFORMANCE TESTING
Ion plasma electron gun research. Final report, 1 June-15 November 1977, 3:45158 (AD-A-048621)
ELECTRON MICROSCOPY/RESEARCH PROGRAMS
High resolution and high voltage electron microscopy at the University of California, Berkeley, 3:45010 (LBL-6998)
ELECTRON MICROSCOPY/SAMPLE PREPARATION
Electron microscopy: a tool for visualizing chromatin, 3:45369 (CONF-780445-1)
ELECTRON PAIRS/PAIR PRODUCTION
Model-independent analysis of the inverse electroproduction of pions at 276 MeV, 3:45696
ELECTRON REACTIONS/DEEP INELASTIC SCATTERING
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
ELECTRON REACTIONS/ELASTIC SCATTERING
Elastic electron scattering from ^{3}He and ^{4}He at high momentum transfer, 3:45687
ELECTRON REACTIONS/INELASTIC SCATTERING
Electroexcitation of giant multiple resonances in ^{64}Zn and ^{124}Sn nuclei, 3:45735
Observation of 12^{-} magnetic spin states in ^{208}Pb, 3:45758
Scattering of high energy electrons by ^{65}Cu, 3:45736
ELECTRON REACTIONS/NEUTRAL-CURRENT INTERACTIONS
Parity violation in atoms induced by radiative corrections, 3:45614
ELECTRON REACTIONS/QUASI-ELASTIC SCATTERING
Quasielastic scattering of electrons by ^{6}Li, ^{7}Li, and ^{9}Be and the final-state interaction, 3:45709
ELECTRON SOURCES/USES
Hygienization of sewage sludge by electron irradiation, 3:44968
ELECTRON SPECTROMETERS/CALIBRATION
Relativistic effects in the calibration of electrostatic electron analyzers. I. Toroidal analyzers, 3:45262
ELECTRON-ATOM COLLISIONS/AUTOIONIZATION
Electronic spectra of autoionization states of barium, observed in electron-atom collisions, 3:45541
Excitation of autoionization states of LiI in electron-atom collisions, 3:45539
ELECTRON-ATOM COLLISIONS/BREMSSTRAHLUNG
Bremsstrahlung in collisions of fast electrons with atoms, 3:45538
ELECTRON-ATOM COLLISIONS/ENERGY-LEVEL TRANSITIONS
Transfer excitation energy between n=5 levels in He I, 3:45515
ELECTRON-ATOM COLLISIONS/EXCITATION
Excitation of autoionization states by electrons near the threshold, 3:45543
Investigation of the Ba emission spectra in the 50-90-nm region with electron impact excitation of atoms, 3:45540
Transfer excitation energy between n=5 levels in He I, 3:45515
ELECTRON-CAPTURE DETECTORS/DESIGN
Ionization detectors with iron-55 as a radioactive source, 3:45265
ELECTRON-DEUTERON INTERACTIONS/DEEP INELASTIC SCATTERING
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
ELECTRON-DEUTERON INTERACTIONS/ELECTROPRODUCTION
Electroproduction of single pions at low ϵ and a measurement of the pion form factor up to $Q^2 = 10$ GeV^2, 3:45562
ELECTRON-ELECTRON COLLISIONS/BREMSSTRAHLUNG
Bremsstrahlung in collisions of electrons in a magnetic field, 3:45610
ELECTRONIC CIRCUITS
See also INTEGRATED CIRCUITS
LOGIC CIRCUITS
ELECTRONIC CIRCUITS/CLEANING
N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX-613-1955(Rev.))
ELECTRON-ION COLLISIONS/ENERGY-LEVEL TRANSITIONS
Intermediate-coupling collision strengths for fine-structure transitions between S and P levels and S and D levels in highly charged He-like ions, 3:45531
ELECTRON-ION COLLISIONS/IONIZATION
Classical approximation for the ionization of a negative ion by electron impact near the threshold, 3:45542
Intermediate-coupling collision strengths for fine-structure transitions between S and P levels and S and D levels in highly charged He-like ions, 3:45531
ELECTRON-MOLECULE COLLISIONS/ENERGY-LEVEL TRANSITIONS
Rate coefficients and inelastic momentum transfer cross sections for electronic excitation of N_2 by electrons, 3:45524
ELECTRON-POSITRON COLLISIONS/ANNIHILATION
Inclusive annihilation of a polarized e^+e^- pair with two detected hadrons, 3:45609
ELECTRON-POSITRON COLLISIONS/INCLUSIVE INTERACTIONS
Inclusive annihilation of a polarized e^+e^- pair with two detected hadrons, 3:45609
ELECTRON-POSITRON INTERACTIONS/ANNIHILATION
Azimuthal correlations of high-transverse-momentum π^0 pairs, 3:45559
Kaon-electron correlations in the semileptonic decays of D mesons, 3:45613
Observartion of $\mu 3\pi$ events in e^+e^- annihilation, 3:45561
Semiclassical sum rules, 3:45600
ELECTRON-POSITRON INTERACTIONS/DEEP INELASTIC SCATTERING
Determination of the sea-quark distributions in the proton by single-particle inclusive reactions, 3:45604
ELECTRON-POSITRON INTERACTIONS/SUM RULES
Semiclassical sum rules, 3:45600
ELECTRON-POSITRON INTERACTIONS/TOTAL CROSS SECTIONS
Production of four pions in e^+e^- collisions and partial conservation of axial current, 3:45606
ELECTRON-PROTON INTERACTIONS/ELECTROPRODUCTION
Electroproduction of single pions at low ϵ and a measurement of the pion form factor up to $Q^2 = 10$ GeV^2, 3:45562
ELECTRONS
See also RUNAWAY ELECTRONS
ELECTRONS/BIOLOGICAL RADIATION EFFECTS
Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr-77-73B)
ELECTRONS/ENERGY LOSSES
Ionization energy loss of relativistic electrons in thin silicon detectors, 3:45266
ELECTRONS/MASS FORMULAE
Calculating the electron mass in terms of measured quantities, 3:45596
ELECTRONS/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
ELECTROPRODUCTION/FORM FACTORS
Electroproduction of low hadronic masses, 3:45598
ELECTROSTATIC ANALYZERS/CALIBRATION
Relativistic effects in the calibration of electrostatic electron analyzers. I. Toroidal analyzers, 3:45262
ELECTROSTATIC PROBES/MAGNETIC FIELDS
Measurement of the properties of a weakly ionized plasma with an electrostatic probe in a magnetic field. I. Charged-particle density, 3:45920
ELECTROSTATIC PROBES/PERFORMANCE
Probe diagnostics of a low-temperature plasma in a magnetic field. I. Experimental procedure and determination of the plasma density, 3:45926
Probe diagnostics of a low-temperature plasma in a magnetic field. II. Determination of the electron temperature and the plasma potential, 3:45927
ELECTROSTATIC PROBES/TRANSIENTS
Electrostatic-probe diagnostics of a weakly ionized plasma in a magnetic field. II, 3:45921
ELEMENTARY PARTICLES
See also HADRONS
LEPTONS
STRANGE PARTICLES
ELEMENTARY PARTICLES/PARTICLE STRUCTURE
Structure of elementary particles and relationships between the different forces of nature, 3:45597
ELEMENTS
See also METALS
ELEMENTS/DISTRIBUTION
Metabolic cycles for toxic elements in the environment. A study of kinetics and mechanism, 3:45311

ELEMENTS/ENVIRONMENTAL TRANSPORT
Metabolic cycles for toxic elements in the environment. A study of kinetics and mechanism, 3:45311
ELEMENTS/METABOLISM
Metabolic cycles for toxic elements in the environment. A study of kinetics and mechanism, 3:45311
ELEMENTS/TOXICITY
Metabolic cycles for toxic elements in the environment. A study of kinetics and mechanism, 3:45311
ELMO BUMPY TORUS/STABILITY
Stability of neoclassical EBT operating points, 3:46009
EMBANKMENTS/DEFORMATION
Use of one-dimensional compression tests and elastic theory in predicting deformations of rockfill embankments, 3:44121
EMERGENCY CORE COOLING SYSTEM
See ECCS
EMISSION SPECTROSCOPY
See also FLUORESCENCE SPECTROSCOPY
EMISSION SPECTROSCOPY/CARRIERS
Single carrier method for the emission spectrometric analysis of uranium-plutonium oxides, 3:44262
EMISSION SPECTROSCOPY/SPECTROMETERS
Specifications for an inductively coupled plasma simultaneous multielement analysis system, 3:45112 (IS-4353)
ENERGY
See also GEOTHERMAL ENERGY
SOLAR ENERGY
ENERGY/ECONOMICS
Progress report for the period January 1-June 30, 1977 (Activities at Energy Economics dust, Univ. of Cologne), 3:44856 (NP-23264)
ENERGY/RESEARCH PROGRAMS
Progress report for the period January 1-June 30, 1977 (Activities at Energy Economics dust, Univ. of Cologne), 3:44856 (NP-23264)
ENERGY/STANDARDIZED TERMINOLOGY
Suggestion for the definition and term limitation in the environment and waste heat utilisation, 3:44917
ENERGY CONSERVATION/ENERGY POLICY
Energy conservation: policy considerations for The States (Study by Council of State Governments), 3:44871
ENERGY CONSERVATION/PLANNING
Maximum energy efficiency improvement target for SIC 28: Chemical and Allied Products Industry, 3:44955 (FEA/D-77/243)
ENERGY CONSERVATION/RECOMMENDATIONS
Advisory Council on Energy Conservation. Paper 5. Road vehicle and engine design: short- and medium-term energy considerations (Monograph), 3:44873
ENERGY CONSUMPTION/BUILDINGS
Energy conservation: chance for low-temperature systems, 3:44934
ENERGY CONSUMPTION/COMPARATIVE EVALUATIONS
Development of primary energy consumption since 1860, 3:44919
ENERGY CONSUMPTION/ECONOMIC DEVELOPMENT
Relation between energy - ecology - economy. An investigation with examples from Brazil and other Third World countries, 3:44858
ENERGY CONSUMPTION/ENVIRONMENTAL IMPACTS
Relation between energy - ecology - economy. An investigation with examples from Brazil and other Third World countries, 3:44858
ENERGY CONSUMPTION/HEATING SYSTEMS
Energy conservation: chance for low-temperature systems, 3:44934
ENERGY CONVERSION
Energy conversion system (Patent), 3:44609
ENERGY DEMAND/FORECASTING
Energy forecasts with special concern of renewable energy sources, 3:44882
Energy supply and demand forecasts - an overview, 3:44874 (CONF-760688-)
ENERGY DEMAND/REGIONAL ANALYSIS
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA-11(Vol.1)(Draft))
ENERGY DEMAND/SYSTEMS ANALYSIS
Analysis of the final energy demand in individual demand sectors and projection of its future development (German Federal Republic), 3:44881
ENERGY FACILITIES/DECISION MAKING
Environmental economics, 3:45320 (NP-23191)
ENERGY FACILITIES/SITE SELECTION
Environmental economics, 3:45320 (NP-23191)
ENERGY POLICY
Will there be an energy crisis in 1985, 3:44875 (CONF-780444-1)
ENERGY SHORTAGES/FORECASTING
Will there be an energy crisis in 1985, 3:44875 (CONF-780444-1)
ENERGY SOURCE DEVELOPMENT/ENVIRONMENTAL IMPACTS
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB-273847)
ENERGY SOURCE DEVELOPMENT/WATER REQUIREMENTS
Analyses of methods for the determination of water availability for energy development, 3:44854 (PB-274080)
Directions in U.S. water research: 1978-1982. Final draft report, 3:44862 (PB-274278)
ENERGY STORAGE
See also FLYWHEEL ENERGY STORAGE
HYDROGEN STORAGE
MAGNETIC ENERGY STORAGE
MAGNETIC ENERGY STORAGE EQUIPMENT
OFF-PEAK ENERGY STORAGE
ENERGY STORAGE/CHEMICAL REACTIONS
Chemical storage of energy, 3:44848
ENERGY SUPPLIES/COMMERCIALIZATION
Estimation of characteristic periods for the development of energy-supply systems, 3:44879
ENERGY SUPPLIES/COMPARATIVE EVALUATIONS
Alternative paths of energy supply - physical-chemical contributions, 3:44918
ENERGY SUPPLIES/FORECASTING
Energy supply and demand forecasts - an overview, 3:44874 (CONF-760688-)
Energy supplies: a look ahead, 3:44877
Open questions in energy supply, 3:44880
Supply 77: EPRI annual energy supply forecasts (Gas; petroleum; coal; nuclear; electricity; 1975-2000), 3:44876 (EPRI-EA-634-SR)
ENERGY SUPPLIES/REGIONAL ANALYSIS
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA-11(Vol.1)(Draft))
ENERGY SUPPLIES/SYSTEMS ANALYSIS
Estimation of characteristic periods for the development of energy-supply systems, 3:44879
ENGINEERING
See also NUCLEAR ENGINEERING
ENGINEERING/RESEARCH PROGRAMS
Mechanical Engineering Department quarterly report, January-March 1978, 3:45132 (UCRL-50016-78-1)
ENGLAND
See UNITED KINGDOM
ENHANCED RECOVERY/RESEARCH PROGRAMS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
ENRICHED URANIUM/ISOTOPE RATIO
Nondestructive determination of nuclear fuel enrichment by Ge(Li) spectrometer, 3:44263
ENRICHMENT (ISOTOPIC)
See ISOTOPE SEPARATION
ENVIRONMENT/ECONOMICS
Environmental economics, 3:45320 (NP-23191)
ENVIRONMENT/POLLUTION
Distribution of mercury in fish and its form of occurrence, 3:45348
Metabolic cycles for toxic elements in the environment. A study of kinetics and mechanism, 3:45311
ENVIRONMENTAL IMPACT STATEMENTS
National Environmental Policy Act, 3:45321 (NP-23191)
ENVIRONMENTAL MATERIALS/BIOLOGICAL EFFECTS
Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis, 3:45422 (PB-274339)
ENVIRONMENTAL MATERIALS/NUCLEAR MAGNETIC RESONANCE
High-sensitivity Fourier transform NMR. Intermolecualr interactions between environmental toxic substances and biological macromolecules. Report for 2 October 1974-1 October 1976, 3:45297 (PB-274011)
ENVIRONMENTAL TRANSPORT
See also ENVIRONMENT
RADIONUCLIDE MIGRATION
ENVIRONMENTAL TRANSPORT/MATHEMATICAL MODELS
Water resources research program. Pollution of coastal waters off Chicago by sinking plumes from the Indiana Harbor Canal, 3:45327 (ANL/WR-77-2)
ENZYMES
See also DEHYDROGENASES
ESTERASES

Development of control algorithms for chemistry systems. Final report, September 1, 1978-September 30, 1977 (Enzyme system control and response surfaces), 3:45109 (UCRL-13826)
EPOXIDES/MECHANICAL PROPERTIES
Acoustical determination of the shear relaxation functions for polymethyl methacrylate and Epon 828-Z, 3:45077
EPOXIDES/REMOVAL
N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX-613-1955(Rev.))
EPOXIDES/RESEARCH PROGRAMS
Organic Materials Division quarterly report, January-March 1977, 3:45078 (UCRL-50019-77-1)
EPOXY COMPOUNDS
See EPOXIDES
EQUATIONS
See also DIFFERENTIAL EQUATIONS
FADDEEV EQUATIONS
INTEGRAL EQUATIONS
EQUATIONS/TRANSFORMATIONS
Roots of two transcendental equations as functions of a continuous real parameter, 3:46145
EQUATIONS (DIFFERENTIAL)
See DIFFERENTIAL EQUATIONS
EQUILIBRIUM PLASMA/BALMER LINES
Reconstruction of the distribution function of a plasma microfield from the H/sub β/ line profile, 3:45919
EQUILIBRIUM PLASMA/BERNSTEIN MODE
Simulation study of Bernstein modes, 3:46044
EQUILIBRIUM PLASMA/PLASMA CONFINEMENT
Plasma confinement in a purely toroidal magnetic confinement system with a self-consistent electric field, 3:45898
EQUILIBRIUM PLASMA/PLASMA WAVES
Steady-State nonlinear waves in a plasma with a modulated electron beam, 3:46062
EQUIPMENT
See also COMPRESSED AIR ENERGY STORAGE EQUIPMENT
DRILLING EQUIPMENT
HEAT RECOVERY EQUIPMENT
MAGNETIC ENERGY STORAGE EQUIPMENT
PARTICLE SIZE CLASSIFIERS
EQUIPMENT/CORROSION
Process for cleaning and removal of sulfur compounds from low Btu gases. Quarterly summary report, January-March 1978, 3:44031 (PNL-2040-9)
ERBIUM 164/ENERGY-LEVEL TRANSITIONS
Multiple high-spin band structure in ^{164}Er, 3:45749
ERBIUM 164/HIGH SPIN STATES
Multiple high-spin band structure in ^{164}Er, 3:45749
ESCA METHOD
See PHOTOELECTRON SPECTROSCOPY
ESTERASES/BIOCHEMICAL REACTION KINETICS
Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3':5'-cyclic monophosphate levels in primary cultures of glia (Rat cerebral cortical tissue), 3:45367 (UCLA-12-1145)
ESTUARIES/POLLUTION
Field observations on the transport of heavy metals in sediments, 3:45343
Investigations of heavy metals and other persistent chemicals, Westernport Bay, Australia (Zn, Cu, and Cd in oysters), 3:45349
ESTUARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
ETHINE
See ACETYLENE
ETHYLENE CARBOXYLIC ACID
See ACRYLIC ACID
ETHYLENE POLYMERS
See POLYETHYLENES
ETHYNE
See ACETYLENE
EUROPE
See also AUSTRIA
BELGIUM
CZECHOSLOVAKIA
FRANCE
GERMAN FEDERAL REPUBLIC
HUNGARY
ICELAND
ITALY
SWITZERLAND
UNITED KINGDOM
USSR
EUROPE/ECONOMIC POLICY
Perspective of the energy policy for Europe: demands and recommendations concerning energy and research policy for overcoming the present stagnation, 3:44884
EUROPEAN COMMUNITIES/ENERGY SUPPLIES
Open questions in energy supply, 3:44880
EUROPEAN COMMUNITIES/RADIOACTIVE WASTE MANAGEMENT
Communities R and D Programme: radioactive waste management and storage. 1. Annual progress report, 3:44277 (EUR-5749)
EUROPIUM/X-RAY SPECTRA
Precise measurements of Kα x-ray linewidths in Eu, Tm, and Ta, 3:45511
EUROPIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
EUROPIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
EUROPIUM OXIDES/FARADAY EFFECT
Rotation of the plane of polarization in EuO subjected to very high magnetic fields, 3:45071
EUROPIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
EUTECTICS/LATENT HEAT STORAGE
Development of latent heat of fusion type materials, 3:44562 (CONF-761220-)
EVACUATED TUBE COLLECTORS/DESIGN
Solar collector apparatus (Patent), 3:44502
Vacuum solar collectors (Patent), 3:44531
Vacuum tube vee-trough collector for solar heating and air conditioning applications, 3:44487 (CONF-761220-)
EVAPORATION MODEL/NUCLEAR REACTION YIELD
Volume versus surface sampling of Maxwellian distributions in nuclear reactions, 3:45793
EVEN-EVEN NUCLEI/ELECTRIC MOMENTS
Electric and dynamic quadrupole moments of even-even nuclei, 3:45781
EVEN-EVEN NUCLEI/GROUND STATES
Electric and dynamic quadrupole moments of even-even nuclei, 3:45781
EVEN-EVEN NUCLEI/NUCLEAR STRUCTURE
Quasi-ground, quasi-beta, and quasi-gamma bands, 3:45743
EVEN-EVEN NUCLEI/QUADRUPOLE MOMENTS
Electric and dynamic quadrupole moments of even-even nuclei, 3:45781
EVENT TREE ANALYSIS
See FAILURE MODE ANALYSIS
EXCURSIONS/MATHEMATICAL MODELS
Fast power excursions in pebble-bed reactors: methods and results, 3:44822
EXHAUST GASES/AIR POLLUTION CONTROL
Waste gas control in cars as an active contribution to environmental protection, 3:44988
EXHAUST GASES/ENVIRONMENTAL EFFECTS
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
Perspectives on the environment, 3:45294 (NP-23191)
EXHAUST GASES/GAS CHROMATOGRAPHY
Simple method for rapid detection of hydrocarbon groups in petrol and exhaust gases, 3:44997
EXHAUST GASES/PURIFICATION
Electrically induced waste air combustion. Applications and advantages of the new process, 3:45241
EXHAUST RECIRCULATION SYSTEMS/DESIGN
Rotary piston engine exhaust gas recycling means (Patent), 3:44980
EXHAUST SYSTEMS
See also EXHAUST GASES
EXHAUST RECIRCULATION SYSTEMS
EXHAUST SYSTEMS/DUST COLLECTORS
Method and device for cleaning underground cavities, especially in bituminous coal mining (Patent), 3:44120
EXPERIMENTAL BREEDER REACTOR-2
See EBR-2 REACTOR
EXPLOSIONS
See also NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
EXPLOSIONS/CHEMICAL REACTION KINETICS
Spontaneous explosions in multiatmosphere H_2-F_2-O_2 mixtures, 3:45177
EXPLOSIVE INSTABILITY
Computation of two-stream explosive instability including harmonics generation and distribution function evolution, 3:46007
Theory for space-time evolution of explosive-type instability, 3:45989 (N-77-33991)

EXXON LIQUEFACTION PROCESS/PILOT PLANTS
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1-May 31, 1977, 3:44067 (FE-2353-17)

F

FADDEEV EQUATIONS/THREE-BODY PROBLEM
Faddeev's equations and the strong-coupling method, 3:45679
FAILURE MODE ANALYSIS/MATHEMATICAL MODELS
Review of methods for the integration of reliability and design engineering, 3:44807 (GA-A-14748)
FARADAY GENERATORS
See MHD GENERATORS
FARMS/APPLIANCES
Electric Utility Rate Design Study: technology for utilizing off-peak energy, Topic 8, 3:44889 (NP-22552)
FARMS/PROCESS HEAT
Producing energy from straw and wood waste, 3:44339
FAST FLUX TEST FACILITY REACTOR
See FFTF REACTOR
FAST NEUTRONS/ENERGY SPECTRA
Integral tests of niobium cross sections through simultaneous measurements of neutron and gamma-ray leakage spectra, 3:45816
FAST REACTORS
See also CFRMF REACTOR
FFTF REACTOR
GCFR TYPE REACTORS
LMFBR TYPE REACTORS
STF REACTOR
ZPR-6 REACTOR
FAST REACTORS/REACTOR KINETICS
Application of sensitivity and uncertainty methodology to fast reactor integral experiment analysis, 3:44737
FAST REACTORS/SHIELDING
Coarse mesh algorithm to solve neutron transport equation in thick shields, 3:44767
FEDERAL REPUBLIC OF GERMANY
See GERMAN FEDERAL REPUBLIC
FEED MATERIALS PLANTS/BIBLIOGRAPHIES
Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964-1977, 3:44253 (NTIS/PS-78/0048)
Uranium mining and milling environmental studies (citations from the Engineering Index data base). Report for 1970-1977, 3:44254 (NTIS/PS-78/0049)
FEED MATERIALS PLANTS/RADIOACTIVE WASTE DISPOSAL
Disposal of solid wastes and liquid effluents from the milling of uranium ores, 3:44289 (CANMET-76-19)
FEED MATERIALS PLANTS/WASTE MANAGEMENT
Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964-1977, 3:44253 (NTIS/PS-78/0048)
Uranium mining and milling environmental studies (citations from the Engineering Index data base). Report for 1970-1977, 3:44254 (NTIS/PS-78/0049)
FERMIONS
See also LEPTONS
FERMIONS/BOUND STATE
Hamiltonian formulation of non-Abelian gauge fields and nonrelativistic bound states, 3:45594
FERMIONS/PAIR PRODUCTION
Creation of fermion pairs by a nonstationary gravitational field, 3:45860
FERMIUM 251/ELECTRON CAPTURE DECAY
Proton states in the Z = 99 nucleus ^{251}Es excited by ^{251}Fm electron capture decay and ^{250}Cf(α,t) reaction, 3:45767
FERRATES
See IRON OXIDES
FERRITE GARNETS/FABRICATION
Manufacturing methods and technology engineering for neodymium-doped YAG laser rods. Quarterly progress report No. 2, 1 June-31 August 1977, 3:45160 (AD-A-048662)
FERROELECTRIC MATERIALS/PIEZOELECTRICITY
Nature of the electric field and the resulting voltage in axially loaded ferroelectric ceramics, 3:45070
FERROELECTRIC MATERIALS/SHOCK WAVES
Electrical response of a slim-loop-ferroelectric ceramic compressed by shock waves, 3:45069
FESHBACH-PORTER-WEISSKOPF MODEL
See OPTICAL MODELS
FFTF REACTOR/EMERGENCY PLAN
FFTF emergency plan, FSAR amendment 9, 3:44781 (HEDL-TI-75002-9)
FFTF REACTOR/REACTOR KINETICS
Biases for current FFTF calculational methods, 3:44780 (HEDL-SA-1393)
FFTF REACTOR/SEALS
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978, 3:44685 (AI-DOE-13231)
FIELD EFFECT TRANSISTORS/RADIATION HARDENING
Radiation hardened field effect device (Patent), 3:45267
FIELD THEORIES
See also QUANTUM FIELD THEORY
FIELD THEORIES/INFRARED DIVERGENCES
Infrared singularities and suppression of bosons in massless Abelian gauge theory, 3:45675
FILTERS
See also AIR FILTERS
FILTERS/DESIGN
Granular bed filter development program. Quarterly report, July-September 1977, 3:44028 (FE-2579-13)
FILTERS/MATHEMATICAL MODELS
Granular bed filter development program. Quarterly report, July-September 1977, 3:44028 (FE-2579-13)
FILTERS/TESTING
Granular bed filter development program. Quarterly report, July-September 1977, 3:44028 (FE-2579-13)
FIREDAMP
See METHANE
FIREPLACES/CLOSURES
Fireplace closure and safety device (Patent), 3:44941
FIRES/TEMPERATURE MEASUREMENT
Temperature monitoring at the seat of fires using the ethylene-acetylene ratio, 3:44116
FIRST WALL/THERMAL STRESSES
Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL-13801)
FISHES
Bioavailability of crude oil from experimentally oiled sediments to English sole (Parophrys vetulus), and pathological consequences, 3:45377
FISHES/BASELINE ECOLOGY
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
FISHES/DISEASES
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
FISHES/IMPINGEMENT
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
FISHES/LIVER
Ageing changes in the liver of two poeciliid fishes, the guppy Poecilia (Lebistes) reticulata and the Amazon molly, P. formosa, 3:45394
FISHES/METABOLISM
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)
FISHES/MORTALITY
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
FISHES/PATHOLOGICAL CHANGES
Pathological changes in a marine fish after a 6-month exposure to petroleum, 3:45416
FISHES/POLLUTION
Distribution of mercury in fish and its form of occurrence, 3:45348
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
Review of dose-response relationships resulting from human exposure to methylmercury compounds, 3:45423
FISHES/TOLERANCE
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
FISSILE MATERIALS
(Materials containing nuclides capable of undergoing fission by interaction with slow neutrons.)
FISSILE MATERIALS/BREEDING
Future of high intensity accelerators in nuclear energy, 3:45246 (AECL-5903)
FISSION/LIQUID DROP MODEL
Dynamics of induced fission, 3:45765

FISSION/NUCLEAR REACTION KINETICS
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
FISSION FRAGMENTS/CHARGE DISTRIBUTION
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
FISSION FRAGMENTS/MASS SPECTRA
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
FISSION NEUTRONS
See also PROMPT NEUTRONS
FISSION NEUTRONS/**MULTIPLICITY**
Review and combination of experimental results for neutron emission per fission of ^{232}Th (1 to 16 MeV), 3:45772 (ORNL/TM-6245)
FISSION PRODUCTS/ENVIRONMENTAL TRANSPORT
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
FISSION PRODUCTS/MASS
General correlation for independent fission product yield uncertainties, 3:45774
FISSION PRODUCTS/NUCLEAR REACTION YIELD
General correlation for independent fission product yield uncertainties, 3:45774
FISSIONABLE MATERIALS
(Materials containing nuclides capable of undergoing fission by any process.)
See also FISSILE MATERIALS
FISSIONABLE MATERIALS/**SAFEGUARDS**
Supervision of fissionable fuel in non-proliferation, 3:44315 (ORNL-tr-4621)
FISSIONABLE MATERIALS MANAGEMENT
See NUCLEAR MATERIALS MANAGEMENT
FISSURED FORMATIONS
See FRACTURED RESERVOIRS
FIXED MIRROR COLLECTORS/DESIGN
FMSC collector subsystem being supplied for Sandia Laboratories' total energy system, 3:44488 (CONF-761220-)
FLAME PROPAGATION/MATHEMATICAL MODELS
Numerical modeling of unsteady flame propagation, 3:45130 (SAND-77-8275)
FLAMES/INHIBITION
Inhibition effects on extinction of polymer burning, 3:45129 (LBL-6898)
FLASH TUBES/DESIGN
Flash bulb, 3:45210
FLAT PLATE COLLECTORS/CONSTRUCTION
Modular construction for solar heat collector (Patent), 3:44523
FLAT PLATE COLLECTORS/**CONVECTION**
Investigation into solar heaters with some methods for convection suppression, 3:44476 (CONF-761220-)
FLAT PLATE COLLECTORS/**DESIGN**
Heat absorber for solar energy (Patent), 3:44525
High efficiency solar panel (Patent), 3:44510
Low-loss solar heat collectors (Patent), 3:44512
Solar collector (Patent), 3:44546
Solar collector unit (Patent), 3:44539
Solar collectos (Patent), 3:44530
Solar energy collector system (Patent), 3:44536
Solar energy collector (Patent), 3:44516
Solar energy collecting device (Patent), 3:44513
Solar fluid heater (Patent), 3:44540
Solar heat absorber (Patent), 3:44500
Solar heat collector (Patent), 3:44548
Solar heating and insulating apparatus (Patent), 3:44545
Solar heating (Patent), 3:44543
Solar panel (Patent), 3:44522
Solar radiation collector (Patent), 3:44515
Thermal panel for heating liquids (Patent), 3:44541
Vented solar collector (Patent), 3:44551
FLAT PLATE COLLECTORS/**EFFICIENCY**
Optimal combinations of flat plate collectors configurations, 3:44485 (CONF-761220-)
FLAT PLATE COLLECTORS/**FABRICATION**
Method of fabricating a solar heating unit (Patent), 3:44524
FLAT PLATE COLLECTORS/**HEAT LOSSES**
Investigation into solar heaters with some methods for convection suppression, 3:44476 (CONF-761220-)
FLAT PLATE COLLECTORS/**HEAT TRANSFER**
Analytical model of flat plate solar collectors, 3:44484 (CONF-761220-)
FLAT PLATE COLLECTORS/**MATERIALS**
Zinc, its properties and its applicability for solar technology, 3:44554
FLAT PLATE COLLECTORS/**OPERATION**
Thermal, fluid flow, and mechanical charcteristics of a subatmospheric distributed flow flat plate collector, 3:44478 (CONF-761220-)
FLAT PLATE COLLECTORS/**OPTIMIZATION**
Optimal combinations of flat plate collectors configurations, 3:44485 (CONF-761220-)
FLAT PLATE COLLECTORS/**PERFORMANCE TESTING**
Thermal testing of flat plate collectors, 3:44481 (CONF-761220-)
FLAT PLATE COLLECTORS/**SEALING MATERIALS**
Sealing problems in solar collectors, 3:44556
FLAT PLATE COLLECTORS/**SOLAR ABSORBERS**
Solar collector having selective film of improved stability to liquid water condensate, 3:44520
FLAT PLATE COLLECTORS/**SPECTRALLY SELECTIVE SURFACES**
New black chrome selective absorbing surface, 3:44483 (CONF-761220-)
Solar collector having selective film of improved stability to liquid water condensate, 3:44520
FLAT PLATE COLLECTORS/**THERMAL EFFICIENCY**
Thermal testing of flat plate collectors, 3:44481 (CONF-761220-)
FLAT PLATE COLLECTORS/**THERMAL INSULATION**
Solar energy collecting device (Patent), 3:44513
FLORIDA/METEOROLOGY
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
FLOWMETERS/DESIGN
N-16 Transit Time Flow Measurement System (TTFM) description and performance (PWR), 3:44651 (WCAP-9264)
FLOWMETERS/**PERFORMANCE**
N-16 Transit Time Flow Measurement System (TTFM) description and performance (PWR), 3:44651 (WCAP-9264)
FLUE GAS/AIR POLLUTION CONTROL
Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB-266103)
FLUE GAS/CHEMICAL ANALYSIS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
FLUE GAS/CLEANING
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)
FLUE GAS/DENITRIFICATION
Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report, 3:44624 (PB-274395)
FLUE GAS/DESULFURIZATION
EPA alkali scrubbing test facility: advanced program. Progress report No. 3, February-November 1976, 3:44625 (PB-274544)
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report, 3:44624 (PB-274395)
Method for removing hydrogen sulfide from sulfur-bearing industrial gases with clause-type reactors (Patent), 3:45236
Waste flue gas desulfurizing method (Patent), 3:44626
FLUE GAS/HOT GAS CLEANUP
Supportive studies in fluidized-bed combustion. Quarterly report, July-September 1977, 3:44131 (ANL/CEN/FE-77-8)
FLUID MECHANICS/OSCILLATION MODES
Small-amplitude periodic sloshing modes of a liquid in a vertical right circular cylinder with a concave spheroidal bottom, 3:45549 (LBL-7204)
FLUIDIZATION/KINETICS
Modeling of a fluidized bed combustor with immersed tubes. Quarterly report, March-August 1977, 3:45231 (FE-1787-8)
FLUIDIZED BED/MATHEMATICAL MODELS
Hydrodynamic modeling of fluidized-bed gasifiers and combustors, 3:44054 (UCID-17759)
FLUIDIZED-BED COMBUSTION/PROBES
Gas-solids interactions in the distribution zone of a fluidized bed: Phase I. Quarterly report, May 1-July 31, 1977, 3:44133 (FE-2451-5)
FLUIDIZED-BED COMBUSTION/**RESEARCH PROGRAMS**
Conceptual design for an atmospheric fluidized-bed direct combustion power generating plant. Phase I. Commercial plant conceptual design. Annual report, January 14, 1977-January 31, 1978, 3:44608 (FE-2583-13)
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
FLUIDIZED-BED COMBUSTORS/HEAT TRANSFER
Modeling of a fluidized bed combustor with immersed tubes. Quarterly report, March-August 1977, 3:45231 (FE-1787-8)

FLUIDIZED-BED COMBUSTORS/MATHEMATICAL MODELS
Hydrodynamic modeling of fluidized-bed gasifiers and combustors, 3:44054 (UCID-17759)
Modeling of a fluidized bed combustor with immersed tubes. Quarterly report, March-August 1977, 3:45231 (FE-1787-8)
FLUIDIZED-BED COMBUSTORS/PERFORMANCE TESTING
Multicell fluidized-bed boiler design, construction, and test program. Monthly progress report No. 66, 3:44614 (FE-1237-T-7)
FLUIDIZED-BED COMBUSTORS/RESEARCH PROGRAMS
Multicell fluidized-bed boiler design, construction, and test program. Monthly progress report No. 66, 3:44614 (FE-1237-T-7)
FLUORESCENCE SPECTROSCOPY
Review of the status of total mercury analysis, 3:45107
FLUORIDES/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
FLUORINATED ALIPHATIC HYDROCARBONS
See also CARBON TETRAFLUORIDE
FLUORINATED ALIPHATIC HYDROCARBONS/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
FLUORINE/ACTIVATION ANALYSIS
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
FLUORINE 19/RANGE
Ranges of projectiles with $8 <$ or $= Z <$ or $= 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
FLUORINE 19/STOPPING POWER
Ranges of projectiles with $8 <$ or $= Z <$ or $= 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
FLUORINE 19 REACTIONS/FISSION
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from ^{194}Hg compound nuclei, 3:45751
FLUORINE 19 REACTIONS/FUSION REACTIONS
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from ^{194}Hg compound nuclei, 3:45751
FLUORINE 19 REACTIONS/PRECOMPOUND-NUCLEUS EMISSION
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from ^{194}Hg compound nuclei, 3:45751
FLUORINE COMPOUNDS/NUCLEAR MAGNETIC RESONANCE
Rotating frame NMR relaxation study of gaseous ClF, 3:45494
FLUTE INSTABILITY/QUASILINEAR PROBLEMS
Particle simulation studies of the lower hybrid drift instability, 3:46005
FLUTE INSTABILITY/STABILIZATION
Suppression of flute waves by a regulator with crossed feedback, 3:46015
FLY ASH/CHEMICAL COMPOSITION
Application of X-ray photoelectron spectroscopy to the study of fly ash, 3:45304
FLY ASH/PHOTOELECTRON SPECTROSCOPY
Application of X-ray photoelectron spectroscopy to the study of fly ash, 3:45304
FLYWHEEL ENERGY STORAGE/USES
Flywheel energy storage systems for road vehicles. Tests with glass-fibre compound constructions, 3:44972
Power supply with flywheel storage (Patent), 3:44840
Study of heat engine/flywheel: hybrid propulsion configuration with electrical transmission system, Phase II, final report. Design definition, 3:44971 (ALO-41/2)
FLYWHEELS/DESIGN
Design definition of a mechanical capacitor. Final report, June 1976-April 1977, 3:44838 (N-77-33603)
FLYWHEELS/RESEARCH PROGRAMS
Flywheel program, 3:44839 (UCRL-50019-77-1)
Organic Materials Division quarterly report, January-March 1977, 3:45078 (UCRL-50019-77-1)
FOCK METHOD
See HARTREE-FOCK METHOD
FOILS/EXPLOSIONS
Determination of voltage in exploding-foil experiments, 3:45280
FOOD
See also BREAD
MILK
Global environment, 3:45329 (NP-23191)
FOOD/FOREIGN POLICY
World food problem and U.S. food politics and policies: 1972-1976 (Book; 75 articles), 3:44865
FOOD/GLOBAL ASPECTS
World food problem and U.S. food politics and policies: 1972-1976 (Book; 75 articles), 3:44865
FOOD/GOVERNMENT POLICIES
World food problem and U.S. food politics and policies: 1972-1976 (Book; 75 articles), 3:44865
FOOD/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
FOOD/RADIOACTIVITY
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
FOOD/WASTE PROCESSING
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
FOOD CHAINS/CONTAMINATION
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
FORESTS/MANAGEMENT
Perspectives on the environment, 3:45294 (NP-23191)
FORMALDEHYDE/ATMOSPHERIC PRECIPITATIONS
Air conservation. Volume 10, Number 6(56), 1976, 3:45310 (PB-276342-T/SL)
FORSCHUNGSREAKTOR BERLIN-2
See BER-2 REACTOR
FORT SHEVCHENKO REACTOR
See BN-350 REACTOR
FOSSIL FUELS
See also COAL
KEROSENE
NATURAL GAS
PEAT
PETROLEUM
SYNTHETIC FUELS
FOSSIL FUELS/COMBUSTION
CO_2 risk. Change in climate by increasing combustion within the next decades, 3:45309
FOSSIL FUELS/CORROSIVE EFFECTS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
FOSSIL FUELS/ENVIRONMENTAL EFFECTS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
FOSSIL-FUEL POWER PLANTS
Comparative electrical generation costs, 3:44717 (CONF-760688-)
FOSSIL-FUEL POWER PLANTS/COMPARATIVE EVALUATIONS
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
FOSSIL-FUEL POWER PLANTS/DESIGN
Conceptual design for an atmospheric fluidized-bed direct combustion power generating plant. Phase I. Commercial plant conceptual design. Annual report, January 14, 1977-January 31, 1978, 3:44608 (FE-2583-13)
FOSSIL-FUEL POWER PLANTS/ECONOMICS
Effects of the construction and operation of a coal-fired power station on production and employment rates, 3:44620
FOSSIL-FUEL POWER PLANTS/ENVIRONMENTAL EFFECTS
Assessment of the health and environmental effects of power generation in the Midwest. Volume II. Ecological effects, 3:44088 (ANL/AA-6(Vol.2)(DRAFT))
Coal handling and coal burning for electricity generation in large power stations in the Federal Republic of Germany, 3:44127
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA-11(Vol.1)(Draft))
FOSSIL-FUEL POWER PLANTS/FLUE GAS
EPA alkali scrubbing test facility: advanced program. Progress report No. 3, February-November 1976, 3:44625 (PB-274544)
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report, 3:44624 (PB-274395)
FOSSIL-FUEL POWER PLANTS/GAS TURBINES
Increased output from open-cycle gas turbine plant using water/steam injection, 3:44618
FOSSIL-FUEL POWER PLANTS/HEALTH HAZARDS
Assessment of the health and environmental effects of power generation in the Midwest. Volume II. Ecological effects, 3:44088 (ANL/AA-6(Vol.2)(DRAFT))

Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
FOSSIL-FUEL POWER PLANTS/POLLUTION REGULATIONS
Coal handling and coal burning for electricity generation in large power stations in the Federal Republic of Germany, 3:44127
FOSSIL-FUEL POWER PLANTS/RESEARCH PROGRAMS
Conceptual design for an atmospheric fluidized-bed direct combustion power generating plant. Phase I. Commercial plant conceptual design. Annual report, January 14, 1977-January 31, 1978, 3:44608 (FE-2583-13)
FOSSIL-FUEL POWER PLANTS/SEISMIC EFFECTS
High pressure steam pipe, 3:44617 (PB-274758)
FOSSIL-FUEL POWER PLANTS/SITE SELECTION
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA-11(Vol.1)(Draft))
FOSSIL-FUEL POWER PLANTS/SOCIO-ECONOMIC FACTORS
National coal utilization assessment. An integrated assessment of increased coal use in the Midwest: impacts and constraints, 3:44093 (ANL/AA-11(Vol.1)(Draft))
FOSSIL-FUEL POWER PLANTS/TECHNOLOGY ASSESSMENT
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB-273847)
FOSSIL-FUEL POWER PLANTS/WASTE HEAT UTILIZATION
Increased output from open-cycle gas turbine plant using water/steam injection, 3:44618
FOUNDATIONS/DYNAMIC LOADS
Measurement of elastic strain in granular material, 3:45234
FOUNDATIONS/SEISMIC EFFECTS
Measurement of elastic strain in granular material, 3:45234
FOUNDRIES/ENERGY CONSERVATION
No-bake systems in modern foundry technology, 3:44958 (IS-M-145)
FOUR-BODY PROBLEM/INTEGRAL EQUATIONS
Integral equations of scattering theory and the strong-coupling method, 3:45803
FRACTURED RESERVOIRS/INDUCTION LOGGING
Experience in application of a probability model for interpreting the results of geological and well logging studies of fractured reservoirs, 3:44149
FRACTURED RESERVOIRS/NEUTRON-GAMMA LOGGING
Experience in application of a probability model for interpreting the results of geological and well logging studies of fractured reservoirs, 3:44149
FRANCE/GEOTHERMAL ENERGY
Report of geothermal multi-purpose utilization inspection tour, 3:44571 (NP-22301)
FRANCIUM 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
FREE RADICALS
See RADICALS
FRESH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS
FRESNEL LENS/DESIGN
Solar concentrator and energy collection system (Patent), 3:44529
FTR REACTOR
See FFTF REACTOR
FUEL ASSEMBLIES
See also FUEL ELEMENT CLUSTERS
FUEL ASSEMBLIES/SUPPORTS
Holddown device for nuclear fuel assembly (Patent), 3:44653
FUEL ASSEMBLIES/THERMAL STRESSES
Localized duct wall cyclic thermal stresses in vented assembly LMFBR cores, 3:44692 (GEFR-00351)
FUEL BUNDLES
See FUEL ELEMENT CLUSTERS
FUEL CANS/OXIDATION
Study of Zircaloy-4: steam oxidation reaction kinetics. Final report, 3:44801 (EPRI-NP-734(Pt.2))
FUEL CELL POWER PLANTS/BOTTOMING CYCLES
Pressurized high temperature fuel cell power plant with bottoming cycle (Patent; waste heat used for compressing oxidizer or for powering steam turbine), 3:44912
FUEL CELL POWER PLANTS/DESIGN
Pressurized high temperature fuel cell power plant with bottoming cycle (Patent; waste heat used for compressing oxidizer or for powering steam turbine), 3:44912
FUEL CELLS
See also HIGH-TEMPERATURE FUEL CELLS
HYDROGEN FUEL CELLS
FUEL CELLS/CATALYSTS
Method for preparing fuel cell catalysts (Patent), 3:44914
FUEL CELLS/DESIGN
Method of operating a fuel cell (Patent; pressure differential between anolyte and catholyte to prevent poisoning), 3:44910
FUEL CELLS/ELECTROLYTES
Solid polymer electrolyte (SPE) fuel cell technology program, phase 1/1a. Final report, 3:44907 (N-77-33605)
FUEL CELLS/FABRICATION
Solid polymer electrolyte (SPE) fuel cell technology program, phase 1/1a. Final report, 3:44907 (N-77-33605)
FUEL CELLS/PERFORMANCE TESTING
Solid polymer electrolyte (SPE) fuel cell technology program, phase 2/2a. Final report, 3:44913 (N-77-33606)
FUEL CYCLE
See also THORIUM CYCLE
Prospects for future CANDU fuel cycles, 3:44667 (AECL-5800)
FUEL CYCLE/EVALUATION
Regional nuclear fuel cycle centres. Basic studies. 1977 report of the IAEA study project. Vol. 2, 3:44727
FUEL CYCLE/PLANNING
International nuclear fuel cycle evaluation program (INFCE), 3:44726
FUEL ELEMENT CLUSTERS/FLUID FLOW
Collection and evaluation of salt mixing data with the real time data acquisition system (LMFBR), 3:44689 (COO-2245-36TR)
SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles, 3:44696 (KFK-2483)
FUEL ELEMENT CLUSTERS/HEAT TRANSFER
SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles, 3:44696 (KFK-2483)
FUEL ELEMENT CLUSTERS/MECHANICAL VIBRATIONS
Flow-induced vibration of nuclear power station components (CANDU reactors), 3:44673 (AECL-5852)
FUEL ELEMENT CLUSTERS/SPACERS
Spacer capture rod to spacer grid attachment device (Patent), 3:44644
FUEL ELEMENTS
See also FUEL ASSEMBLIES
FUEL CANS
FUEL PINS
FUEL RODS
NUCLEAR FUELS
SPENT FUEL ELEMENTS
Plutonium redistribution in mixed-oxide $(U,Pu)O_2$ nuclear fuel elements, 3:44772 (AERE-TP-714)
FUEL ELEMENTS/ACTIVITY LEVELS
Prediction of fission product and actinide levels in irradiated fuel and cladding, 3:44738
Spatial distribution of fission product energy, 3:44831
FUEL ELEMENTS/HEAT TRANSFER
In-reactor measurement of fuel-to-sheath heat transfer coefficients between UO_2 and stainless steel, 3:44770 (AECL-5400)
FUEL ELEMENTS/PERFORMANCE
Fuel performance improvement program. Quarterly progress report, October-December 1977 (LWR), 3:44639 (COO-4066-5)
FUEL ELEMENTS/PERFORMANCE TESTING
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978, 3:44657 (GA-A-14863)
FUEL FABRICATION PLANTS/NUCLEAR MATERIALS MANAGEMENT
INMACS - An approach to on-line nuclear materials accounting and control in a fuel fabrication environment, 3:44305 (AECL-5902)
FUEL FEEDING SYSTEMS/COMPARATIVE EVALUATIONS
Coal feed system development plan, 3:44053 (TID-27900)
FUEL FEEDING SYSTEMS/HEAT TRANSFER
Development of a continuous dry coal screw feeder: Phase II. Quarterly technical progress report, April 1, 1977-June 30, 1977, 3:44038 (FE-1794-25)
FUEL FEEDING SYSTEMS/MATHEMATICAL MODELS
Development of a continuous dry coal screw feeder: Phase II. Quarterly technical progress report, April 1, 1977-June 30, 1977, 3:44038 (FE-1794-25)
FUEL FEEDING SYSTEMS/PERFORMANCE TESTING
Development of a continuous dry coal screw feeder: Phase II. Quarterly technical progress report, April 1, 1977-June 30, 1977, 3:44038 (FE-1794-25)
FUEL FEEDING SYSTEMS/RECOMMENDATIONS
Coal feed system development plan, 3:44053 (TID-27900)
FUEL FEEDING SYSTEMS/RESEARCH PROGRAMS
Coal feed system development plan, 3:44053 (TID-27900)
FUEL GAS
See also LOW BTU GAS
PRODUCER GAS
FUEL GAS/CALORIFIC VALUE
Determining the gross and net calorific value of gaseous fuels, 3:44190

Hoe Creek II field experiment on underground coal gasification, preliminary results, 3:44056 (UCRL-80592)
FUEL GAS/HOT GAS CLEANUP
Granular bed filter development program. Quarterly report, July-September 1977, 3:44028 (FE-2579-13)
FUEL GAS/PURIFICATION
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
FUEL OILS
See also RESIDUAL FUELS
FUEL OILS/DESULFURIZATION
Method to desulphurize crude petroleums, heavy fuel oils and similar heavy oils (Patent), 3:44168
FUEL PELLETS/DEFECTS
Automatic surface flaw inspection of nuclear fuel pellets, 3:44260 (HEDL-SA-1409)
FUEL PELLETS/INSPECTION
Automatic surface flaw inspection of nuclear fuel pellets, 3:44260 (HEDL-SA-1409)
FUEL PINS/SIMULATION
Performance testing of single electrically heated fuel pin simulators for PWR LOCA experiments, 3:44808 (ORNL/NUREG-35)
FUEL REPROCESSING PLANTS
See also WEST VALLEY PROCESSING PLANT
FUEL REPROCESSING PLANTS/HEARINGS
One hundred days at Windscale, 3:44267
Windscale. A summary of the evidence and the argument, 3:44271
FUEL REPROCESSING PLANTS/HIGH-LEVEL RADIOACTIVE WASTES
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 3: reprocessed fuel: plutonium product, and high level waste, 3:44264 (AECL-4436/2)
FUEL REPROCESSING PLANTS/LICENSING
One hundred days at Windscale, 3:44267
Windscale. A summary of the evidence and the argument, 3:44271
FUEL REPROCESSING PLANTS/RADIATION ACCIDENTS
Quarterly statement on incidents at nuclear installations, 3:44270
Quarterly statement on incidents at nuclear installations, second quarter 1977, 3:44269
Quarterly statement on incidents at nuclear installations, third quarter 1977, 3:44268
FUEL REPROCESSING PLANTS/SAFEGUARDS
Capability for intrusion detection at nuclear fuel sites, 3:44309 (NUREG/CR-0027)
FUEL REPROCESSING PLANTS/SAFETY
Problems of dismantling, treating and analyzing highly irradiated fuel elements, 3:45151
FUEL REPROCESSING PLANTS/SECURITY
Capability for intrusion detection at nuclear fuel sites, 3:44309 (NUREG/CR-0027)
FUEL REPROCESSING PLANTS/SHIELDING
Removal diffusion theory for calculating the effectiveness of neutron and gamma-ray shields for nuclear reactors and chemical plants, 3:44766
FUEL RODS/INSPECTION
Detection of radioactive surface and weld contamination (ThO_2 and $^{233}UO_2$) on light water breeder reactor fuel rods using alpha ionization detectors (LWBR development program), 3:44697 (WAPD-TM-1130)
FUEL-CLADDING INTERACTIONS
Review of session V of the ANS topical meeting, St. Charles, Il., USA, May 1977: "Mechanisms for pellet cladding interactions", 3:44771 (AECL-5850)
FUEL-COOLANT INTERACTIONS/RESEARCH PROGRAMS
Fuel-Coolant Thermal Interaction Project. Progress report No. 8 (LMFBR), 3:44799 (COO-2781-14)
FUMAROLES/GEOCHEMICAL SURVEYS
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP-22850)
FUMAROLIC FLUIDS/CHEMICAL COMPOSITION
Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP-22298)
FUMES
See AEROSOLS
FUNDAMENTAL PARTICLES
See ELEMENTARY PARTICLES
FURNACES/CATALYTIC COMBUSTORS
Catalytic combustion: a look back, a look forward, 3:45230 (CONF-771015-17)
FURNACES/DESIGN
Design study for a 24-cm HTGR microsphere coating furnace, 3:44261 (ORNL/TM-6321)
FUSED SALTS
See MOLTEN SALTS
FUSION REACTIONS
(Heavy-ion reactions in which most or all of participating nucleons form single nucleus.)
FUSION REACTIONS/NUCLEAR REACTION KINETICS
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
FUSION REACTORS
See THERMONUCLEAR REACTORS

G

GADOLINIUM 160 TARGET/BERYLLIUM 9 REACTIONS
Multiple high-spin band structure in ^{164}Er, 3:45749
GADOLINIUM FLUORIDES/MAGNETO-OPTICAL EFFECTS
Magneto-optical properties of KTb_3F_10 and $LiTbF_4$ crystals, 3:45090
GAGES (PRESSURE)
See PRESSURE GAGES
GAGES (STRAIN)
See STRAIN GAGES
GALACTIC EVOLUTION/METALS
Distribution of metals among the galactic populations and the evolution of the Galaxy, 3:45466
GALLIUM 67/BETA-PLUS DECAY
Multiparticle configurations in the odd-neutron nuclei ^{61}Ni and ^{67}Zn populated by decay of ^{61}Cu, ^{67}Cu, and ^{67}Ga, 3:45730
GALLIUM 68/RADIONUCLIDE KINETICS
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
GALLIUM ALLOYS/TRANSITION TEMPERATURE
Effect of magnetic impurities and pressure on the critical temperature of a superconductor with an AuGa=-type band structure, 3:45047
GALLIUM ANTIMONIDES/INFRARED SPECTRA
Apparatus for the infrared spectroscopic study of solids at high pressures (12 kbars) and low temperatures (4.2°K and 2°K), 3:45099 (UCRL-Trans-11353)
GALLIUM ARSENIDE SOLAR CELLS/DESIGN
Aluminum arsenide eutectic gallium arsenide solar cell (Patent), 3:44376
GAMMA CAMERAS
See also POSITRON CAMERAS
GAMMA CAMERAS/DISPLAY DEVICES
Halftone display, particularly for a high resolution radioactivity distribution detection system, 3:45260
GAMMA DETECTION/SOLID SCINTILLATION DETECTORS
Pulse-shape discrimination of high-energy neutrons and gamma rays in NaI(Tl), 3:45256
GAMMA DOSIMETRY/EXPERIMENT PLANNING
Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr-77-72)
GAMMA RADIATION/BUILDUP
Theory and use of Maniscalco two-medium buildup factors, 3:45815
GAMMA RADIATION/ENERGY SPECTRA
Integral tests of niobium cross sections through simultaneous measurements of neutron and gamma-ray leakage spectra, 3:45816
GAMMA RADIATION/SAFETY STANDARDS
Shielding standards: a case history, 3:45825
GAMMA RADIATION/TRANSMISSION
Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron (Cross sections, neutron and gamma spectra), 3:45718
GAMMA SOURCES
(See also specific radioisotopes.)
GAMMA SOURCES/BIOLOGICAL RADIATION EFFECTS
Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr-77-73B)
GAMMA TRANSMISSION SCANNING
See PHOTON TRANSMISSION SCANNING
GAMMA TRANSPORT THEORY
See also PHOTON TRANSPORT
GAMMA TRANSPORT THEORY/MONTE CARLO METHOD
Partial-range expansion for multigroup Monte Carlo photon transport, 3:45814
GAMMA-RAY LASERS/FEASIBILITY STUDIES
Nuclear techniques for directed emission and swtiched operation of grasers, 3:45219
On the feasibility of grasers, 3:45217
Possibility of grasers using nuclear excitation by electron transition, 3:45220

GAMMA-RAY LASERS/KINETICS
Kinetics of stimulated emission in neutron-pumped nuclear laser systems, 3:45218
GARIGLIANO REACTOR/REACTOR OPERATION
Ten-yearly report on operations at the Garigliano nuclear power station. Progress report 1 May 1964-31 December 1973, 3:44640 (EUR-5649)
GAS BLANKETS
Possibility of wall-protecting cold-plasma layer formation in a tokamak reactor, 3:46092
GAS COOLANTS
See GASES
GAS COOLED FAST BREEDER REACTOR
See GCFR REACTOR
GAS COOLED FAST BREEDER REACTORS
See GCFR TYPE REACTORS
GAS ENGINES
See INTERNAL COMBUSTION ENGINES
GAS FUELED REACTORS/REACTOR KINETICS
Neutronics analysis of the low proliferating gas core reactor, 3:44731 (CONF-780401-7)
GAS INJECTION/DESIGN
Fast hydrogen gas injection system for plasma physics experiments, 3:45869
GAS LASERS
See also CARBON DIOXIDE LASERS
CARBON MONOXIDE LASERS
HELIUM-NEON LASERS
GAS LASERS/DESIGN
1/4-J discharge pumped KrF laser, 3:45178
GAS LASERS/ELECTRIC DISCHARGES
Periodic operation of a KrF excimer laser, 3:45208
GAS LASERS/ELECTRICAL PUMPING
Ion plasma electron gun research. Final report, 1 June-15 November 1977, 3:45158 (AD-A-048621)
Visible laser discharge studies. Quarterly progress report, December 1, 1976-February 28, 1977, 3:45163 (COO-2922-1)
Visible laser discharge studies. Quarterly progress report, June 1, 1977-August 31, 1977 (CdHg vapors), 3:45164 (COO-2922-3)
GAS LASERS/EMISSION SPECTRA
Atomic fluorine laser: spectral pressure dependence, 3:45209
Measurement of 16-μm emission of a two-photon-excited ammonia laser, 3:45180
GAS LASERS/EXCITATION
Intense proton-beam-pumped Ar-N_2 laser, 3:45170
Inversion of the Na resonance line by selective photodissociation of NaI, 3:45169
Photodissociation lasers using forbidden transitions of selenium atoms, 3:45172
Rate coefficients and inelastic momentum transfer cross sections for electronic excitation of N_2 by electrons, 3:45524
GAS LASERS/FAR ULTRAVIOLET RADIATION
Calculation of the photoionization cross section of the $^1\Sigma$/sub u/$^+$ excimer state of Ar_2, 3:45496
GAS LASERS/FEASIBILITY STUDIES
Prospects of the high power iodine laser, 3:45212
$TbCl_3$-$AlCl_3$ vapors: characteristics of a potential new high energy gas phase laser medium, 3:45162 (CONF-780202-21)
GAS LASERS/FREQUENCY CONTROL
Multimode ring laser, 3:45196
GAS LASERS/FREQUENCY SELECTION
Frequency selection in a helium-cadmium laser with transverse rf excitation, 3:45207
Nonlinear generation of Lyman-alpha radiation, 3:45168
GAS LASERS/KRYPTON FLUORIDES
1/4-J discharge pumped KrF laser, 3:45178
GAS LASERS/LASER MATERIALS
Covalent and ionic states of the rare gas monofluorides, 3:45174
GAS LASERS/MODULATION
Mode-locked krypton ion laser with a 50-psec pulse width in the near uv, 3:45171
Polarization of the active medium of a multimode gas laser with excitation modulation, 3:45197
GAS LASERS/NOISE
Frequency selection in a helium-cadmium laser with transverse rf excitation, 3:45207
GAS LASERS/NUCLEAR PUMPING
Direct nuclear pumped lasers: status and potential applications, 3:45215
GAS LASERS/PERFORMANCE
Terawatt iodine laser, 3:45213
GAS LASERS/POLARIZATION
Polarization of the active medium of a multimode gas laser with excitation modulation, 3:45197
GAS LASERS/POWER
Periodic operation of a KrF excimer laser, 3:45208
GAS LASERS/REACTION KINETICS
Measurements of some reaction rates of importance in KrF lasers, 3:45188
GAS LASERS/RESEARCH PROGRAMS
Research on molecular lasers. Final report, 1 October 1968-30 September 1976, 3:45159 (AD-A-048643)
GAS OILS/CRACKING
Method for the catalytic cracking of two hydrocarbon fractions and equipment to carry it out (Patent), 3:44166
GAS OILS/FLUIDIZED BED
Method for the catalytic cracking of two hydrocarbon fractions and equipment to carry it out (Patent), 3:44166
GAS SPILLS/HAZARDS
Liquid-natural-gas spill-effects program, 3:44195 (UCRL-50016-78-1)
GAS TURBINES/CATALYTIC COMBUSTORS
Catalytic combustion: a look back, a look forward, 3:45230 (CONF-771015-17)
GAS TURBINES/CORROSION
Parameter monitoring for corrosion control of utility gas turbines. Interim report, 3:44613 (EPRI-AF-665)
GAS TURBINES/CORROSION PROTECTION
Parameter monitoring for corrosion control of utility gas turbines. Interim report, 3:44613 (EPRI-AF-665)
GAS TURBINES/DESIGN
Parametric study of turbine systems for compressed air energy storage plants, 3:44836 (ANL/ES-64)
GAS TURBINES/NOZZLES
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1-December 30, 1977, 3:44615 (FE-1765-42)
GAS TURBINES/PERFORMANCE
Analytical study of intake tuning for helical-rotor expanders, 3:45136 (UCRL-52449)
GAS TURBINES/RESEARCH PROGRAMS
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1-December 30, 1977, 3:44615 (FE-1765-42)
High temperature turbine technology program: Phase I. Topical report. Phase III preliminary turbine sub-system technology readiness verification program plan, 3:44616 (FE-2291-12)
GAS TURBINES/STEAM INJECTION
Increased output from open-cycle gas turbine plant using water/steam injection, 3:44618
GAS TURBINES/TURBINE BLADES
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1-December 30, 1977, 3:44615 (FE-1765-42)
GASEOUS DIFFUSION PLANTS/SAFEGUARDS
Feasibility of nondestructive assay measurements in uranium enrichment plants, 3:44308 (LA-7212-MS)
GASES
See also AIR
NATURAL GAS
VAPORS
GASES/LASER-RADIATION HEATING
Infrared fluorescence measurement of equilibrium and vibrational temperatures in laser-irradiated gases, 3:45522
GASOLINE/COMBUSTION PRODUCTS
Simple method for rapid detection of hydrocarbon groups in petrol and exhaust gases, 3:44997
GASOLINE/PRODUCTION
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977-October 28, 1977, 3:44044 (FE-2416-20)
Research and development as an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. Quarterly report, September-November 1977 (Tracer studies), 3:44060 (FE-1800-21)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
GASTEROPODS
See MOLLUSCS
GASTROINTESTINAL TRACT/RADIONUCLIDE KINETICS
Gastrointestinal absorption and distribution of ^{144}Ce in the suckling pig, 3:45405
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)

GAUGE INVARIANCE/C INVARIANCE
Disconnected gauge groups and the global violation of charge conservation, 3:45654
GAUGE INVARIANCE/HAMILTONIANS
Hamiltonian formulation of non-Abelian gauge fields and nonrelativistic bound states, 3:45594
GAUGE INVARIANCE/PROPAGATOR
Instantaneous approximation for a gauge theory with dressed vertices, 3:45592
GAUGE INVARIANCE/SCATTERING AMPLITUDES
Processes with fermion exchange in nonabelian gauge theories, 3:45676
GAUGE INVARIANCE/SPACE-TIME
Classification of SU(2) gauge fields, 3:45665
GAUGE INVARIANCE/SU-2 GROUPS
Classification of SU(2) gauge fields, 3:45665
GAUGE INVARIANCE/SYMMETRY BREAKING
Spontaneous breaking of scale invariance in gauge theories, 3:45652
GAUGE INVARIANCE/U GROUPS
Gribov ambiguities in the U gauge, 3:45672
GCFR REACTOR/REACTOR INTERNALS
Thermal stress analysis of the 300-MW(e) gas-cooled fast breeder reactor grid plate, 3:44690 (GA-A-14766)
GCFR REACTOR/SAFETY ENGINEERING
Review of methods for the integration of reliability and design engineering, 3:44807 (GA-A-14748)
GCFR TYPE REACTORS/FUEL ELEMENT CLUSTERS
SAGAPO. A computer code for the thermo-fluiddynamic analysis of gas cooled fuel element bundles, 3:44696 (KFK-2483)
GENE MUTATIONS/CHROMOSOMAL ABERRATIONS
Chromosomal translocation causing overproduction of iso-2-cytochrome c in yeast, 3:45373
GENERAL RELATIVITY THEORY/POINCARE GROUPS
Geometry of superspace and local supersymmetry, 3:45858
GENERAL RELATIVITY THEORY/SPACE-TIME
Relativity of space and time finiteness-infiniteness for a matter-filled universe, 3:45470
Relativity of space finiteness-infiniteness for some Friedmann cosmological models, 3:45471
GENERAL RELATIVITY THEORY/SYMMETRY
Geometry of superspace and local supersymmetry, 3:45858
GENERATORS (STEAM)
See STEAM GENERATORS
GEOLOGIC DEPOSITS
See also ALLUVIAL DEPOSITS
NATURAL GAS DEPOSITS
OIL SHALE DEPOSITS
URANIUM DEPOSITS
GEOLOGIC DEPOSITS/ROCK MECHANICS
Deformation of a jointed rock mass, 3:44297 (ORNL-tr-4567)
GEOLOGIC FORMATIONS/TEMPERATURE MEASUREMENT
Formation temperature gauge feasibility study. Volume II (Neutron radiometric gauge), 3:44584 (SAN-0936P48-1)
GEOLOGIC STRUCTURES/PERMITTIVITY
Method and apparatus for investigating earth formations utilizing microwave electromagnetic energy (Patent), 3:45279
GEOMAGNETIC FIELD/TABLES
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
GEORGIA/COASTAL WATERS
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
GEORGIA/METEOROLOGY
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
GEOTHERMAL ENERGY/ENERGY CONVERSION
Energy conversion system (Patent), 3:44609
GEOTHERMAL ENERGY/SOCIO-ECONOMIC FACTORS
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 3:44600 (SAN-1326-1/1)
GEOTHERMAL ENERGY/USES
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 3:44600 (SAN-1326-1/1)
GEOTHERMAL EXPLORATION/GEOPHYSICAL SURVEYS
Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL-6815)
GEOTHERMAL FIELDS
See also CERRO PRIETO GEOTHERMAL FIELD
HATCHOBARU GEOTHERMAL FIELD
HEBER GEOTHERMAL FIELD
LARDERELLO GEOTHERMAL FIELD
MATSUKAWA GEOTHERMAL FIELD
OTAKE GEOTHERMAL FIELD
SALTON SEA GEOTHERMAL FIELD
GEOTHERMAL FIELDS/GEOCHEMICAL SURVEYS
Geochemical geothermal exploration in Noya geothermal field, 3:44587 (CONF-7610123-5)
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry (Miravalles and Las Pailas), 3:44589 (NP-23013)
GEOTHERMAL FIELDS/GEOCHEMISTRY
Rock-water solution systems in geothermal fields, 3:44601 (CONF-7610123-4)
GEOTHERMAL FIELDS/HYDROLOGY
Rock-water solution systems in geothermal fields, 3:44601 (CONF-7610123-4)
GEOTHERMAL FIELDS/HYDROTHERMAL ALTERATION
Rock-water solution systems in geothermal fields, 3:44601 (CONF-7610123-4)
GEOTHERMAL FIELDS/MATHEMATICAL MODELS
Problems of geothermics using the Rhinegraben as an example, 3:44575 (NP-22841)
GEOTHERMAL FLUIDS
See also FUMAROLIC FLUIDS
GEOTHERMAL FLUIDS/ADSORPTION
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
GEOTHERMAL FLUIDS/TOXICITY
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
GEOTHERMAL FLUIDS/TWO-PHASE FLOW
Evaluation of geothermal energy exploration and resource assessment. Final report. Volume II. Two phase flow in the geothermal wellbore, 3:44599 (SAN-1269-1(Vol.2))
GEOTHERMAL FLUIDS/WASTE PROCESSING
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
GEOTHERMAL HEATING/FEASIBILITY STUDIES
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 3:44600 (SAN-1326-1/1)
GEOTHERMAL POWER PLANTS/ECONOMIC ANALYSIS
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL-50777)
GEOTHERMAL POWER PLANTS/EQUIPMENT
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL-50777)
GEOTHERMAL POWER PLANTS/MATERIALS TESTING
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL-50777)
GEOTHERMAL POWER PLANTS/SAFETY
Safety measures for geothermal power generation plant without steady monitoring system, 3:44598 (NP-22300)
GEOTHERMAL PROCESS HEAT/FEASIBILITY STUDIES
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 3:44600 (SAN-1326-1/1)
GEOTHERMAL WELLS/RESEARCH PROGRAMS
Geothermal well technology: drilling and completions program plan, 3:44596 (SAND-77-1630)
GEOTHERMAL WELLS/TWO-PHASE FLOW
Evaluation of geothermal energy exploration and resource assessment. Final report. Volume II. Two phase flow in the geothermal wellbore, 3:44599 (SAN-1269-1(Vol.2))
GEOTHERMAL WELLS/WELL COMPLETION
Geothermal well technology: drilling and completions program plan, 3:44596 (SAND-77-1630)
GEOTHERMAL WELLS/WELL DRILLING
Geothermal well technology: drilling and completions program plan, 3:44596 (SAND-77-1630)
GERMAN FEDERAL REPUBLIC/ELECTRIC UTILITIES
Situation of the electric power industry, 3:44895
GERMAN FEDERAL REPUBLIC/ENERGY CONSUMPTION
Primary energy consumption rose in 1976 to some 371 million t CE. Electricity generation target 'more or less reached' in 1976, 3:44920
Situation of the electric power industry, 3:44895
GERMAN FEDERAL REPUBLIC/ENERGY DEMAND
Analysis of the final energy demand in individual demand sectors and projection of its future development, 3:44881

GERMAN FEDERAL REPUBLIC/ENERGY POLICY
Promotion of solar technology in Baden-Wuerttemberg, 3:44885
GERMAN FEDERAL REPUBLIC/GEOPHYSICAL SURVEYS
Geothermal energy and the lithosphere in the south-west of FRG/ Switzerland, 3:44585
GERMAN FEDERAL REPUBLIC/GEOTHERMAL FIELDS
Problems of geothermics using the Rhinegraben as an example, 3:44575 (NP-22841)
GERMAN FEDERAL REPUBLIC/HEAT FLOW
Problems of geothermics using the Rhinegraben as an example, 3:44575 (NP-22841)
GERMAN FEDERAL REPUBLIC/LEGISLATION
Legislation: energy law. Act amending the third electricity generation act, 3:44145
GERMAN FEDERAL REPUBLIC/NATURAL GAS INDUSTRY
Problems of price determination for gas due to connections between the international markets of natural gas supply and demand in the Federal Republic of Germany. DIW study on changes proposed by the Monopoly Commission, 3:44887
GERMAN FEDERAL REPUBLIC/RENEWABLE ENERGY SOURCES
Possibilities and principal features of the use of renewable resources in the FRG, 3:44898
GERMAN FEDERAL REPUBLIC/SOLAR ENERGY
Problems arising from the introduction of solar systems in the FRG. Problem identification and remedies, 3:44351
GERMAN FEDERAL REPUBLIC/URANIUM DEPOSITS
Uranium prospecting in the Federal Republic of Germany, 3:44252
GERMAN FR ORGANIZATIONS
See also WAK
GERMAN FR ORGANIZATIONS/AIR POLLUTION CONTROL
Origins, development, and targets of the VDI Kommission Reinhaltung der Luft, 3:45308
GERMANIUM/PHYSICAL RADIATION EFFECTS
Kinetics of accumulation of radiation defects in p-type germanium irradiated with 30 and 660 MeV protons, 3:45061
GERMANIUM 67/ENERGY LEVELS
Mass and low-lying levels of ^{6}7Ge; trends in the structure of /sup 63,65/Ni, /sup 65,67/Zn, and /sup 67,69/Ge, 3:45732
GERMANIUM 67/MASS DEFECT
Mass and low-lying levels of ^{6}7Ge; trends in the structure of /sup 63,65/Ni, /sup 65,67/Zn, and /sup 67,69/Ge, 3:45732
GERMANIUM ALLOYS/CRITICAL FIELD
Critical magnetic fields of superconducting compounds based on Nb_3Ge obtained at high pressures and temperatures, 3:45035
GERMANIUM ALLOYS/HYPERFINE STRUCTURE
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
GERMANIUM ALLOYS/ISOMER SHIFT
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
GERMANY (FEDERAL REPUBLIC)
See GERMAN FEDERAL REPUBLIC
GIANT STARS/STELLAR RADIATION
Origin of the intrinsic linear polarization of the optical emission of stars with infrared excesses, 3:45447
GIROMILL TURBINES/CONTROL SYSTEMS
Vertical axis wind turbines (Patent), 3:44603
GLASS/HELIUM
Effect of morphology on helium mobility in soda-lime-silica glasses, 3:45095
GLASS/RADIATION EFFECTS
Effect of internal alpha radiation on borosilicate glass containing Savannah River Plant waste, 3:44290 (DP-1482)
GLASS/SELF-DIFFUSION
Self diffusion of calcium ions in soda lime and slag glasses, 3:45120 (ORNL-tr-4627)
GLASS/SURFACE CLEANING
Advances in cleaning metal and glass surfaces to micron-level cleanliness, 3:45182
GLAZING MATERIALS
Glazing for transmitting solar radiation (Patent), 3:44537
GLIOBLASTOMAS
See NEOPLASMS
NERVOUS SYSTEM DISEASES
GLUCOSE/BIOSYNTHESIS
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
GOLD/CHARGED-PARTICLE TRANSPORT
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
GOLD/PERMEABILITY
Hydrogen and deuterium permeation in copper alloys, copper-gold brazing alloys, gold, and the in situ growth of stable oxide permeation barriers, 3:45027
GOLD 197 TARGET/KRYPTON 86 REACTIONS
Evidence for angular momentum depolarization and for enhanced sequential fission in the reaction ^{197}Au(^{86}Kr, Z$_3$f), 3:45760
Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
GOLD 197 TARGET/NEUTRON REACTIONS
Neutron capture cross-section ratios of ^{240}Pu, ^{242}Pu, ^{238}U, and ^{197}Au in the energy range from 10 to 90 keV, 3:45771
GOLD 197 TARGET/XENON 136 REACTIONS
Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
GOLD 199/ENERGY LEVELS
Nuclear Data Sheets for A=199, 3:45756
GOLD 199/NUCLEAR STRUCTURE
Nuclear Data Sheets for A=199, 3:45756
GOLD 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
GOLD ALLOYS/PERMEABILITY
Hydrogen and deuterium permeation in copper alloys, copper-gold brazing alloys, gold, and the in situ growth of stable oxide permeation barriers, 3:45027
GOLD ALLOYS/PHYSICAL RADIATION EFFECTS
Direct observation of the point-defect structure of depleted-zones in ion-irradiated metals, 3:45055 (COO-3158-62)
GOLD ALLOYS/TRANSITION TEMPERATURE
Effect of magnetic impurities and pressure on the critical temperature of a superconductor with an AuGa=-type band structure, 3:45047
GOLD IONS/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535
GOLDSTONE BOSONS
(Massless particles occurring in certain broken-symmetry theories.)
GOLDSTONE BOSONS/MASS FORMULAE
Instantons and the hypothetical light boson, 3:45661
GOLDSTONE BOSONS/U-1 GROUPS
Field theory on a lattice: Absence of goldstone bosons in the U(1) model in two dimensions, 3:45655
GRAPHITE
See also PYROLYTIC CARBON
GRAPHITE/FRACTURE PROPERTIES
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978, 3:44657 (GA-A-14863)
GRAPHITE/MATERIALS TESTING
Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL-13801)
GRAPHITE/X-RAY DIFFRACTION
Small-angle x-ray scattering from oriented ellipsoidal voids in pyrolytic graphite, 3:45082
GRASERS
See GAMMA-RAY LASERS
GRASS/CONTAMINATION
Laboratory research on tailings stabilization methods and their effectiveness in radiation containment (Uranium, reduction of radon exhalation), 3:45314 (GJT-21)
GRASS/RADIOACTIVITY
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
GRAVITATION/EXPERIMENT PLANNING
Feasibility analysis of gravitational experiments in space. Final report, 3:45467 (N-77-33223)
Studies of orbital Eotvos experiments. Final report, 3:45468 (N-77-33226)
GRAVITATIONAL FIELDS/PAIR PRODUCTION
Creation of fermion pairs by a nonstationary gravitational field, 3:45860
GREAT BRITAIN
See UNITED KINGDOM
GREEN RIVER FORMATION/BIBLIOGRAPHIES
Bibliography of the geology of the Green River Formation, Colorado, Utah, and Wyoming, to March 1, 1977, 3:44199 (CIRC-754)
GREEN RIVER FORMATION/GEOLOGY
Bibliography of the geology of the Green River Formation, Colorado, Utah, and Wyoming, to March 1, 1977, 3:44199 (CIRC-754)
GREEN RIVER FORMATION/NATURAL GAS WELLS
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
GREENHOUSE EFFECT/CLIMATES
CO_2 risk. Change in climate by increasing combustion within the next decades, 3:45309

GREENHOUSES/LATENT HEAT STORAGE
Solar heating system for greenhouses using LAING latent-energy storages, 3:44568
GREENHOUSES/MATERIALS
Ideal greenhouse, 3:44408 (CONF-761220-)
GREENHOUSES/SOLAR SPACE HEATING
Greenhouseheating with sun-energy, 3:44453
Solar energy system for greenhouses, 3:44454
GROUND STATES/MASS FORMULAE
Nuclear mass relations and equations, 3:45782
GROUND WATER/CHEMICAL COMPOSITION
Interpretation of uranium content of ground water in west-central Kansas, 3:44231 (USGS-CIRC-753)
GROUND WATER/RADIOACTIVITY
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
GROUND WATER/RADIONUCLIDE MIGRATION
Geosphere model: description, opinions, and input requirements (Radionuclide migration in ground water), 3:45359 (BNWL-tr-268)
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
GROUND WATER/RECHARGE
Preparation, construction, and operation of a plant for recharging groundwater in the Halle Region, 3:44091
GROUND WATER/SAMPLING
Lightweight and cheap depth sampler, 3:44110
Procedures manual for groundwater reconnaissance sampling (NURE), 3:44214 (K/UR-12)
GROUND WATER/WATER POLLUTION
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
GROUP THEORY/IRREDUCIBLE REPRESENTATIONS
Reduction of the direct product of irreducible representations of the supersymmetry group in the rest frame, 3:46146
GULF GENERAL ATOMIC FAST BREEDER REACTOR
See GCFR REACTOR
GUNDREMMINGEN-2 REACTOR/REACTOR OPERATION
Gundremmingen (KRB) nuclear power plant. Annual report 1975, 3:44641 (EUR-5651)
GUNDREMMINGER KRB REACTOR
See RWE-BAYERNWERK REACTOR

H

HADRON-HADRON INTERACTIONS
See also MESON-MESON INTERACTIONS
NUCLEON-NUCLEON INTERACTIONS
HADRON-HADRON INTERACTIONS/CROSS SECTIONS
Quantum-chromodynamic spin-spin asymmetries in large-P/sub T/ hadron production with polarized beam and target, 3:45629
HADRON-HADRON INTERACTIONS/ELASTIC SCATTERING
Corrections to the solution of the unitarity relation, 3:45630
HADRON-HADRON INTERACTIONS/FRAGMENTATION
s-dependence of proton fragmentation by hadrons. II. Incident laboratory momenta 30-250 GeV/c, 3:45582
HADRON-HADRON INTERACTIONS/INCLUSIVE INTERACTIONS
Quantum-chromodynamic spin-spin asymmetries in large-P/sub T/ hadron production with polarized beam and target, 3:45629
s-dependence of proton fragmentation by hadrons. II. Incident laboratory momenta 30-250 GeV/c, 3:45582
HADRON-HADRON INTERACTIONS/PARTICLE PRODUCTION
Gluon contribution to hadronic J/psi production, 3:45626
HADRON-HADRON INTERACTIONS/UNITARITY
Corrections to the solution of the unitarity relation, 3:45630
HADRONS
See also MESONS
HADRONS/ELECTROPRODUCTION
Electroproduction of low hadronic masses, 3:45598
HADRONS/EXCITED STATES
Radial excitations of hadronic bags, 3:45627
HADRONS/PAIR PRODUCTION
Inclusive annihilation of a polarized $e^+ e^-$ pair with two detected hadrons, 3:45609
HADRONS/PARTICLE PRODUCTION
Correlations between two hadrons at large transverse momenta, 3:45575
Hadronic polarization in neutrino scattering, 3:45612
HADRONS/PHOTOPRODUCTION
Electroproduction of low hadronic masses, 3:45598
HAFNIUM ALLOYS/CORROSION RESISTANCE
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June-31 August 1977, 3:45053 (FE-2299-15)
HALL GENERATORS
See MHD GENERATORS
HANFORD RESERVATION/RADIOACTIVE WASTE MANAGEMENT
Assessment of Hanford burial grounds and interim TRU storage, 3:44292 (RHO-CD-78(Rev.))
HARTREE-FOCK METHOD/TIME DEPENDENCE
Extended time-dependent Hartree-Fock approximation with particle collisions, 3:45780
HATCHOBARU GEOTHERMAL FIELD/GEOCHEMICAL SURVEYS
Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields, 3:44586 (CONF-7410177-3)
HATCHOBARU GEOTHERMAL FIELD/GEOLOGY
Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields, 3:44586 (CONF-7410177-3)
HAWAII/GEOTHERMAL EXPLORATION
Exploration for geothermal energy on Oahu, Hawaii. Final report, 3:44570 (AD-A-046954)
HAZARDOUS MATERIALS/WASTE MANAGEMENT
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume II. Primary and secondary nonferrous smelting and refining. Final report, May 1974-April 1977, 3:45301 (PB-276170)
Draft environmental impact statement. Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico, 3:45324 (DOE/EIS-0018-D)
Information about hazardous waste management facilities, 3:44964 (PB-274881)
HEALTH PHYSICS
See RADIATION PROTECTION
HEAT DISTRIBUTION SYSTEMS/DESIGN
Thermal distribution and storage system for solar and other heating and cooling (Patent), 3:44841
HEAT EXCHANGERS
See also HEAT PUMPS
HEAT EXCHANGERS/EFFICIENCY
Reply to comments on seawater side enhancement for OTEC heat exchangers, 3:44400 (CONF-770331-)
HEAT EXCHANGERS/MATHEMATICAL MODELS
Economic optimization of counter-flow heat exchanges, 3:45221
HEAT EXCHANGERS/MECHANICAL VIBRATIONS
Flow-induced vibration of nuclear power station components (CANDU reactors), 3:44673 (AECL-5852)
HEAT EXCHANGERS/PERFORMANCE
Numerical simulation of parabolic collectors for solar heat exchangers, 3:44492 (CONF-761220-)
HEAT PIPES/DESIGN
Solar heat pipe (Patent), 3:44534
HEAT PUMPS/ENERGY EFFICIENCY
Energy efficiency program for room air conditioners, central air conditioners, dehumidifiers, and heat pumps, 3:44926 (SAI-77-858-LJ)
HEAT PUMPS/HEAT RECOVERY
Experiences with heat recovery from waste water, 3:44922 (AED-Conf-1977-072-007)
HEAT PUMPS/OPERATION
Air/water heat pump, 3:44944 (NP-tr-2012)
Experiences with heat recovery from waste water, 3:44922 (AED-Conf-1977-072-007)
HEAT PUMPS/PERFORMANCE TESTING
Air/water heat pump, 3:44944 (NP-tr-2012)
HEAT RECOVERY EQUIPMENT/DESIGN
Method of recovering energy by means of a cyclic thermodynamic process (Patent), 3:45244
HEAT RECOVERY EQUIPMENT/USES
Utilization of thermal energy in the plastic industry, 3:44962
HEAT STORAGE
See also LATENT HEAT STORAGE
SENSIBLE HEAT STORAGE
THERMOCHEMICAL HEAT STORAGE
Storage of solar energy. Necessity and some principles, 3:44565
HEATERS/PERFORMANCE TESTING
Performance testing of single electrically heated fuel pin simulators for PWR LOCA experiments, 3:44808 (ORNL/NUREG-35)
HEAVY ION REACTIONS
See also ARGON 40 REACTIONS
BORON 11 REACTIONS
CARBON 12 REACTIONS
CARBON 13 REACTIONS
FLUORINE 19 REACTIONS

LITHIUM 6 REACTIONS
NEON 20 REACTIONS
NITROGEN 14 REACTIONS
NITROGEN 15 REACTIONS
OXYGEN 16 REACTIONS
OXYGEN 18 REACTIONS
QUASI-FISSION
XENON 136 REACTIONS

HEAVY ION REACTIONS/CENTRAL POTENTIAL
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)

HEAVY ION REACTIONS/ELASTIC SCATTERING
Spin-orbit terms in heavy-ion elastic scattering potentials, 3:45794

HEAVY ION REACTIONS/FRAGMENTATION
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)

HEAVY ION REACTIONS/FUSION REACTIONS
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
Separation of the fusion channel in heavy-ion reactions, 3:45802
Statistical-model analyses of heavy-ion-induced fusion reaction products, 3:45738

HEAVY ION REACTIONS/INELASTIC SCATTERING
Gas-dynamic mechanism of inelastic collisions of heavy nuclei at high energies, 3:45807

HEAVY ION REACTIONS/NUCLEAR REACTION KINETICS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)

HEAVY ION REACTIONS/NUCLEOSYNTHESIS
Explosive nucleosynthesis, equilibrium thermodynamics, and relativistic heavy-ion collisions, 3:45442

HEAVY ION REACTIONS/PERIPHERAL COLLISIONS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)

HEAVY ION REACTIONS/QUASI-FISSION
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809

HEAVY IONS/MICRODOSIMETRY
Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison, 3:45827 (BNL-24330)

HEAVY LEPTONS/LEPTONIC DECAY
Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber, 3:45571
Origins of neutrino events with three muons, 3:45617

HEAVY LEPTONS/PARTICLE PRODUCTION
Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber, 3:45571

HEAVY NUCLEI/PION CONDENSATION
Presence of π^- mesons in heavy atomic nuclei, 3:45761

HEAVY NUCLEI/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))

HEAVY WATER MODERATED REACTORS
See also CANDU TYPE REACTORS
CP-3 REACTOR
R-A REACTOR
SGHWR REACTOR
WR-1 REACTOR

HEAVY WATER MODERATED REACTORS/CONTROL ROD WORTHS
Adjuster rod experiments in ZED-2, 3:44674 (AECL-5853)

HEAVY WATER MODERATED REACTORS/FUEL MANAGEMENT
Nuclear reactor fuel management, 3:44682

HEBER GEOTHERMAL FIELD/GEOTHERMAL POWER PLANTS
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL-50777)

HELIOSTATS/THERMAL EXPANSION
Heliostat structural stability as a function of solat heating and ambient temperature changes, 3:44398 (CONF-761220-)

HELIUM/ATOM-ATOM COLLISIONS
Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H, 3:45525

HELIUM/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)

HELIUM/ELECTRON-ATOM COLLISIONS
Transfer excitation energy between n=5 levels in He I, 3:45515

HELIUM/ION DRIFT
Mobilities and longitudinal diffusion coefficients for Cs^+ ions in He and Ne gas, 3:45093

HELIUM/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535

HELIUM/MAGNETIC RESONANCE
Observation of magnetic resonance in the 1^1S_0 ground state of optically oriented ^3He atoms by the use of transverse modulation of the magnetic field, 3:45513

HELIUM/MASS SPECTROSCOPY
Uranium exploration using helium detection: a case study, 3:44225 (USGS-CIRC-753)

HELIUM/MUONIC MOLECULES
Schroedinger perturbation theory in the adiabatic representation of the three-body problem, 3:45521

HELIUM 3/CHARGE DISTRIBUTION
Charge asymmetry in ^3He-^3H and the neutron-proton mass difference, 3:45683

HELIUM 3/MASS
Nonlocal contributions to the rho-ω mixing charge-symmetry-breaking force, 3:45682

HELIUM 3/NUCLEAR STRUCTURE
Charge asymmetry in ^3He-^3H and the neutron-proton mass difference, 3:45683

HELIUM 3/SECOND SOUND
Interaction between first and second sound in He^3-He^4 solutions, 3:45554

HELIUM 3/SOUND WAVES
Interaction between first and second sound in He^3-He^4 solutions, 3:45554

HELIUM 3/SUPERFLUIDITY
Possible new superfluidity mechanism for a He^3 film on a metal surface, 3:45552

HELIUM 3/TOPOLOGY
Investigation of singularities in superfluid He^3 in liquid crystals by the homotopic topology methods, 3:45555

HELIUM 3 TARGET/ELECTRON REACTIONS
Elastic electron scattering from ^3He and ^4He at high momentum transfer, 3:45687

HELIUM 3 TARGET/NEUTRON REACTIONS
Neutron scattering lengths for ^3He, 3:45690

HELIUM 4
See also HELIUM II

HELIUM 4/SECOND SOUND
Interaction between first and second sound in He^3-He^4 solutions, 3:45554

HELIUM 4/SOUND WAVES
Interaction between first and second sound in He^3-He^4 solutions, 3:45554

HELIUM 4 TARGET/ELECTRON REACTIONS
Elastic electron scattering from ^3He and ^4He at high momentum transfer, 3:45687

HELIUM 4 TARGET/PROTON REACTIONS
Distorted-wave Born-approximation description of the $^4He(p,d)^3He$ reaction at E/sub p/ = 770 MeV, 3:45684
p-^4He elastic scattering at 5.75 GeV/c, 3:45573

HELIUM 4 TARGET/TRITON REACTIONS
(t,p) reactions on ^4He, ^6Li, ^7Li, ^9Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705

HELIUM 6/ENERGY LEVELS
(t,p) reactions on ^4He, ^6Li, ^7Li, ^9Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705

HELIUM HYDRIDES/ELECTRONIC STRUCTURE
Configuration interaction studies of the HeH^+ molecular ion. IV. The triplet sigma, pi, and delta states, 3:45506

HELIUM II/SOUND WAVES
Wave propagation in fluids with a nonlinear friction-velocity relationship (in the example of He II), 3:45553

HELIUM IONS/ION-ATOM COLLISIONS
Nonstatistical population of magnetic substates of the $(1s^{-1}2p^{-1})$ $^1P_1$ state in Al, 3:45532

HELIUM-NEON LASERS/EXCITATION
Effect of excitation conditions on the radial distribution of population inversion in the active element of a He-Ne laser, 3:45200

HELIUM-NEON LASERS/POPULATION INVERSION
Effect of excitation conditions on the radial distribution of population inversion in the active element of a He-Ne laser, 3:45200

HELIUM-NEON LASERS/ZEEMAN EFFECT
Nonlinear Zeeman effect in a ring gas laser, 3:45201
HEPTANE/ADSORPTION ISOTHERMS
Adsorption of vapors of organic substances on coal, 3:44078
HEXANE/ADSORPTION ISOTHERMS
Adsorption of vapors of organic substances on coal, 3:44078
HFR REACTOR/REACTOR EXPERIMENTAL FACILITIES
Prototype experiment of an irradiation facility for large HTR fuel specimens in the HFR Petten. Project E 91 - 0, 3:44779 (EUR-5456)
HGI2 SEMICONDUCTOR DETECTORS/RESOLUTION
Characteristic x-ray spectra of sodium and magnesium measured at room temperature using mercuric iodide detectors, 3:45255
HIGGS MODEL/GAUGE INVARIANCE
Higgs mechanism in the temporal gauge, 3:45664
HIGGS MODEL/NEUTRAL-CURRENT INTERACTIONS
Symmetry breaking and naturalness of parity conservation in weak neutral currents in left-right-symmetric gauge theories, 3:45649
HIGGS MODEL/U-1 GROUPS
Topological excitations in the Abelian Higgs model, 3:45662
HIGH EXPLOSIVES
See CHEMICAL EXPLOSIVES
HIGH FLUX REACTOR PETTEN
See HFR REACTOR
HIGH-BETA PLASMA/DIFFUSION
Classical diffusion in large-aspect toroidal plasmas, 3:45881
HIGH-BETA PLASMA/MAGNETOHYDRODYNAMICS
Helically symmetric equilibrium of current-carrying finite beta plasma, 3:45948 (N-77-33987)
HIGH-FREQUENCY DISCHARGES/ELECTROMAGNETIC FIELDS
Self-localized electromagnetic fields in a dense gas, 3:45894
HIGH-LEVEL RADIOACTIVE WASTES/CHEMICAL REACTIONS
Review of liquid-tank interaction analysis technique, 3:44293 (UCRL-13835)
HIGH-TEMPERATURE FUEL CELLS/DESIGN
Method and apparatus for electrochemical generation of power from hydrogen (Patent; molten salt electrolyte), 3:44911
HIGH-TEMPERATURE GAS-COOLED REACTOR
See HTGR TYPE REACTORS
HIGHWAYS
See ROADS
HOLMIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
HOLMIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
HOMOGENEOUS PLASMA/MAGNETIC COMPRESSION
Self-similar snowplow plasma flows, 3:45963
HOMOGENEOUS PLASMA/PARAMETRIC INSTABILITIES
Parametric excitation of nonlinear longitudinal waves in a magnetized plasma by an inhomogeneous electromagnetic field, 3:46028
HORMONES/RADIOSENSITIVITY EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (X and gamma radiation, electrons, negative pions), 3:45398 (STI/PUB-441(Vol.1))
HOT CELLS/OPERATION
Problems of dismantling, treating and analyzing highly irradiated fuel elements, 3:45151
HOT LABS/OPERATION
Problems of dismantling, treating and analyzing highly irradiated fuel elements, 3:45151
HOT PLASMA
See also LASER-PRODUCED PLASMA
HOT PLASMA/ELECTRON-ION COLLISIONS
Intermediate-coupling collision strengths for fine-structure transitions between S and P levels and S and D levels in highly charged He-like ions, 3:45531
HOT PLASMA/HEAT FLUX
Heat flux reduction by electromagnetic instabilities, 3:46002
HOT PLASMA/HEAT LOSSES
Dimensional estimates of the cooling time of a plasma with $\beta >> 1$, 3:45893
HOT PLASMA/PLASMA MICROINSTABILITIES
Heat flux reduction by electromagnetic instabilities, 3:46002
HOT SPRINGS/GEOCHEMICAL SURVEYS
Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP-22298)
HOT SPRINGS/GEOCHEMISTRY
Analysis of interrelation of hot spring waters using a multi-component concentration correlation matrix, 3:44574 (CONF-7610123-6)
HOT-DRY-ROCK SYSTEMS/FRACTURING
Rock drilling and crushing methods: congealing crush of hot dry rock, 3:44595 (CONF-770754-1)
HOUSES/EVAPORATIVE COOLING
Cooling of low cost houses in North-East Brasil, 3:44937 (CONF-761220-)
HOUSES/HEATING SYSTEMS
Air/water heat pump, 3:44944 (NP-tr-2012)
HOUSES/SOLAR COOLING SYSTEMS
Modular solar house, 3:44404 (CONF-761220-)
Performance of the UNL-LES solar-heat pump demonstration home, 3:44413 (CONF-761220-)
Solar energy research facility at the University of Texas at Arlington, 3:44410 (CONF-761220-)
HOUSES/SOLAR HEATING SYSTEMS
Brighton Polytechnic Integrated Solar Dwelling (ISD), 3:44411 (CONF-761220-)
Europe's biggest solar house stands in Swabia. Hot water supply and space heating in 'Heggbach', a home for the disabled, 3:44450
Modular solar house, 3:44404 (CONF-761220-)
Operating results: a competitively priced home heated by concentrating solar collectors, 3:44420 (CONF-761220-)
Performance of the UNL-LES solar-heat pump demonstration home, 3:44413 (CONF-761220-)
Solar energy research facility at the University of Texas at Arlington, 3:44410 (CONF-761220-)
HOUSES/SOLAR SPACE HEATING
Use of solar energy for space heating in individual dwellings in Kansas, 3:44417 (CONF-761220-)
HOUSES/SOLAR WATER HEATERS
Europe's biggest solar house stands in Swabia. Hot water supply and space heating in 'Heggbach', a home for the disabled, 3:44450
HOUSES/SPACE HEATING
Folding principle and the simulation of the dynamic thermal spatial behavior. Pt. 2, 3:44942
HTGR TYPE REACTORS/CONTAINMENT SYSTEMS
Containment Atmosphere Response (CAR) program status report, 3:44806 (GA-A-14699)
HTGR TYPE REACTORS/DEPRESSURIZATION
Containment Atmosphere Response (CAR) program status report, 3:44806 (GA-A-14699)
HTGR TYPE REACTORS/FUEL ELEMENTS
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978 (Graphite and fuel irradiation; fission product release), 3:44657 (GA-A-14863)
HTGR TYPE REACTORS/MARKET
Importance of the high-temperature reactor for the future energy market, 3:44659
HTGR TYPE REACTORS/PRESSURE VESSELS
Tensile tests of 2500-kip prestressing tendons for the PCRV, 3:44656 (GA-A-14768)
HTGR TYPE REACTORS/PRIMARY COOLANT CIRCUITS
Prediction of primary circuit contamination in power reactors, 3:44654
HTGR TYPE REACTORS/RADIOACTIVE EFFLUENTS
Measurement of liquid radioactive materials for monitoring radioactive emissions. Draft, 3:44714
HTGR TYPE REACTORS/REACTOR ACCIDENTS
Evaluation of the General Atomic codes TAP and RECA for HTGR accident analyses, 3:44809 (ORNL/NUREG/TM-178)
HTGR TYPE REACTORS/REACTOR CORES
COCO: a computer program for seismic analysis of a single column of the HTGR core, 3:44805 (GA-A-14600)
HTGR TYPE REACTORS/SPENT FUEL ELEMENTS
Calculations of neutron radiation levels from HTGR spent fuel, 3:44660
HTGR TYPE REACTORS/STEAM SYSTEMS
HTGR steam cycle configuration evaluation report, 3:44658 (GA-A-14900)
HUMAN CELLS
See ANIMAL CELLS
HUMAN POPULATIONS/DISEASES
Methylmercury analysis (a review and some data) (Minamata disease in Japan), 3:45341
HUMAN POPULATIONS/LIFE SPAN
Carcinogens in the environment, 3:45421 (NP-23191)
HUMAN POPULATIONS/NEOPLASMS
Carcinogens in the environment, 3:45421 (NP-23191)
HUMAN POPULATIONS/POLLUTION
Distribution of mercury in fish and its form of occurrence, 3:45348

Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
Review of dose-response relationships resulting from human exposure to methylmercury compounds, 3:45423
HUMAN POPULATIONS/RADIATION HAZARDS
Health. The risks assessment, 3:45263
HUMIC ACIDS/MOLECULAR MODELS
New structural model for humic material which shows sites for attachment of oxidized uranium species, 3:44240 (USGS-CIRC-753)
HUMUS/ISOTOPE RATIO
Stable carbon isotope ratios and chemical properties of kerogen and extractable organic matter in prephanerozoic and phanerozoic sediments: their interrelations and possible paleobiological significance, 3:44209
HUNGARY/GEOTHERMAL ENERGY
Report of geothermal multi-purpose utilization inspection tour, 3:44571 (NP-22301)
HVAC SYSTEMS/ELECTRIC CABLES
Surge behavior of UD cable systems. Final report, 3:44632 (EPRI-EL-720)
HYBRID REACTORS/FUEL CYCLE
Basic requirements of laser fusion power production and laser fusion-fission plutonium breeding, 3:46105
HYDRATES/LATENT HEAT STORAGE
Application of latent-heat storage element in solar-heated buildings, 3:44557
HYDRAULIC CONTROL DEVICES/SIMULATION
Simulation of drive characteristics of JT-60 movable limiter, 3:46125 (JAERI-M-7130)
HYDRAULIC FRACTURING/RESEARCH PROGRAMS
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
HYDRAZINE/PHOTOSYNTHESIS
Liquid synfuel photosynthesis: intentions and examples, 3:44338
HYDRIODIC ACID/ELECTROLYSIS
Thermochemical processes for hydrogen production. Progress report, August 1, 1977-February 28, 1978, 3:44327 (LA-7234-PR)
HYDROCARBONS
See also ALKANES
ALKENES
ANTHRACENE
NAPHTHALENE
PYRENE
STYRENE
HYDROCARBONS/AIR POLLUTION MONITORS
Tunable laser spectral survey of molecular air pollutants. Final report, 3:45302 (PB-276188)
HYDROCARBONS/BIOLOGICAL ACCUMULATION
Absence of aryl hydrocarbon hydroxylase (AHH) in three marine bivalves, 3:45376
Effects of uptake and discharge of petroleum hydrocarbons on the respiration of the soft-shell clam, Mya arenaria, 3:45412
HYDROCARBONS/CATALYTIC CRACKING
Fluidized cracking catalyst regeneration apparatus (Patent), 3:44161
Hydrocarbon hydroconversion process employing hydroxy-aluminum stabilized catalysts supports (Patent), 3:44160
HYDROCARBONS/CHEMICAL COMPOSITION
Individual components of low-boiling (up to 125°C) hydrocarbons in organic matter of sedimentary rocks (Comparison of chemical composition of petroleum and organic matter of rocks), 3:45435
HYDROCARBONS/ENVIRONMENTAL EFFECTS
Recruitment of benthic animals as a function of petroleum hydrocarbon concentrations in the sediment, 3:45106
HYDROCARBONS/METABOLISM
Absence of aryl hydrocarbon hydroxylase (AHH) in three marine bivalves, 3:45376
HYDROCARBONS/MONITORING
The 1976 NRL air quality data. Final report, 3:45289 (AD-A-048750)
HYDROCARBONS/OXIDATION
Selective catalytic oxidation of hydrocarbons as a challenge to the chemical engineer, 3:44164
HYDROCARBONS/PHASE STUDIES
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
HYDROCARBONS/QUANTITATIVE CHEMICAL ANALYSIS
Contribution of chronic petroleum inputs to Narragansett Bay and Rhode Island Sound sediments, 3:45335
Recruitment of benthic animals as a function of petroleum hydrocarbon concentrations in the sediment, 3:45106
HYDROCARBONS/REFORMER PROCESSES
Process for steam reforming of hydrocarbons (Patent), 3:44162
HYDROCARBONS/SYNTHESIS
Process for production of gas rich in methane which can be exchanged for natural gas (Patent), 3:44335
HYDROCARBONS/WEATHERING
Weathering characteristics of petroleum hydrocarbons deposited in fine clay marine sediments, Searsport, Maine, 3:45333
HYDROCHLORIC ACID/CHEMICAL REACTIONS
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
HYDROCORTISONE/BIOLOGICAL EFFECTS
Hormonal effects on differentiation in neutral cultures (Rats), 3:45371 (UCLA-12-1144)
HYDROCYCLONES
See CYCLONE SEPARATORS
HYDRODYNAMIC MODEL/HEAVY ION REACTIONS
Gas-dynamic mechanism of inelastic collisions of heavy nuclei at high energies, 3:45807
HYDRODYNAMIC MODEL/ISOSPIN
Dynamics of nuclear fluid. IV. Some spin and isospin properties in the hydrodynamical model, 3:45788
HYDRODYNAMIC MODEL/SPIN
Dynamics of nuclear fluid. IV. Some spin and isospin properties in the hydrodynamical model, 3:45788
HYDROELECTRIC POWER PLANTS
See also PUMPED STORAGE POWER PLANTS
HYDROELECTRIC POWER PLANTS/WATER RESERVOIRS
Reservoirs for hydropower and improved pump-fed power stations in neighboring foreign countries, 3:44837
HYDROGEN/ATOM-ATOM COLLISIONS
Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H, 3:45525
Photon and positive ion production from collisions of superthermal hydrogen atoms with lithium atoms and molecules, 3:45523
Production of polarized H^- or D^- ions by a colliding-beam method, 3:45502
HYDROGEN/CHEMICAL REACTIONS
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly report, July-September 1976, 3:44033 (FE-2305-3)
HYDROGEN/CORROSIVE EFFECTS
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
HYDROGEN/DIFFUSION
Hydrogen and deuterium permeation in copper alloys, copper-gold brazing alloys, gold, and the in situ growth of stable oxide permeation barriers, 3:45027
HYDROGEN/DISTRIBUTION
Hydrogen Energy Storage Program: five-year plan (Five year plan), 3:44326 (DOE/ET-0046)
HYDROGEN/DUAL TEMPERATURE PROCESS
Hydrogen isotope exchange in metal hydride columns, 3:45122 (BNL-50755)
HYDROGEN/EXCITATION
Collisional excitation of interstellar molecules: H_2, 3:45537
HYDROGEN/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535
HYDROGEN/ISOTOPE SEPARATION
Enrichment of hydrogen isotopes using the low-temperature glow-discharge technique, 3:44321
HYDROGEN/MOLECULE-MOLECULE COLLISIONS
Collisional excitation of interstellar molecules: H_2, 3:45537
HYDROGEN/STARK EFFECT
Classical and quantum treatment of the Stark broadening of hydrogen lines, 3:45518
HYDROGEN/TRANSPORT
Hydrogen Energy Storage Program: five-year plan (Five year plan), 3:44326 (DOE/ET-0046)
HYDROGEN/USES
Hydrogen Energy Storage Program: five-year plan (Five year plan), 3:44326 (DOE/ET-0046)
HYDROGEN 1 TARGET/ELECTRON REACTIONS
Parity violation in atoms induced by radiative corrections, 3:45614
HYDROGEN 2
See DEUTERIUM
HYDROGEN 3
See TRITIUM
HYDROGEN CHLORIDES
See HYDROCHLORIC ACID
HYDROGEN DEUTERIDE/COSMOCHEMISTRY
Infrared emission of interstellar HD molecules, 3:45465
HYDROGEN DEUTERIDE/INFRARED SPECTRA
Infrared emission of interstellar HD molecules, 3:45465
HYDROGEN DEUTERIDE/NUCLEAR MAGNETIC RESONANCE
NMR determination of the triton-proton magnetic moment ratio to within 10^{-6}%, 3:45517

HYDROGEN FUEL CELLS/DESIGN
Method and apparatus for electrochemical generation of power from hydrogen (Patent; molten salt electrolyte), 3:44911
HYDROGEN IONS 1 MINUS/BEAM PRODUCTION
Production of polarized H^- or D^- ions by a colliding-beam method, 3:45502
HYDROGEN IONS 1 MINUS/ELECTRON-ION COLLISIONS
Classical approximation for the ionization of a negative ion by electron impact near the threshold, 3:45542
HYDROGEN IONS 1 MINUS/ION SOURCES
Escape of cesium from a surface-plasma H^--ion source, 3:45504
HYDROGEN PEROXIDE/PHOTOSYNTHESIS
Liquid synfuel photosynthesis: intentions and examples, 3:44338
HYDROGEN PRODUCTION
Hydrogen Energy Storage Program: five-year plan (Five year plan), 3:44326 (DOE/ET-0046)
Method to convert coal and water into at least hydrocarbon and system to carry out such a method (Patent, reactor process heat), 3:44059
HYDROGEN PRODUCTION/ELECTROLYSIS
Solar powered gas generation (Patent; combined solar thermal power plant for electrolysis of seawater and solar still), 3:44399
HYDROGEN PRODUCTION/PHOTOELECTROLYSIS
Evaluation of the commercial feasibility of hydrogen production by the solar photoelectrolysis of water. Task I interim report, 3:44390 (TID-27802)
HYDROGEN PRODUCTION/RESEARCH PROGRAMS
Thermochemical processes for hydrogen production. Progress report, August 1, 1977-February 28, 1978, 3:44327 (LA-7234-PR)
HYDROGEN PRODUCTION/THERMOCHEMICAL PROCESSES
Thermochemical processes for hydrogen production. Progress report, August 1, 1977-February 28, 1978, 3:44327 (LA-7234-PR)
HYDROGEN STORAGE
See also HYDROGEN-BASED ECONOMY
TANKS
Hydrogen Energy Storage Program: five-year plan (Five year plan), 3:44326 (DOE/ET-0046)
HYDROGEN SULFIDES/ABUNDANCE
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP-23013)
HYDROGEN SULFIDES/AUGER EFFECT
Anomalous spectral and yield features of Auger emission from symmetric molecules, 3:45510
HYDROGEN SULFIDES/CORROSIVE EFFECTS
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
HYDROGEN SULFIDES/REMOVAL
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977-October 28, 1977, 3:44044 (FE-2416-20)
Method for removing hydrogen sulfide from sulfur-bearing industrial gases with clause-type reactors (Patent), 3:45236
HYDROGEN TRITIDE/NUCLEAR MAGNETIC RESONANCE
NMR determination of the triton-proton magnetic moment ratio to within 10^{-6}%, 3:45517
HYDROGEN-BASED ECONOMY
Hydrogen - energy carrier of the future, 3:44325
HYDROMAGNETIC WAVES
See also ALFVEN WAVES
MAGNETOACOUSTIC WAVES
HYDROMAGNETIC WAVES/TRAPPED-PARTICLE INSTABILITY
Interaction of fast electrons with hydromagnetic waves at a bounce resonance, 3:46022
HYPERTHERMIA/RADIOSENSITIVITY EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (X and gamma radiation, electrons, negative pions), 3:45398 (STI/PUB-441(Vol.1))

I

IAEA SAFEGUARDS/SPECIFICATIONS
Analytical laboratory to facilitate international safeguards, 3:44317
ICELAND/GEOTHERMAL ENERGY
Report of geothermal multi-purpose utilization inspection tour, 3:44571 (NP-22301)
ICELAND/THERMAL WATERS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
ILLINOIS/AIR POLLUTION
Development of the 1975 area source inventory for the state of Illinois. Final report, 3:44878 (PB-274685)
ILLINOIS/FUEL CONSUMPTION
Development of the 1975 area source inventory for the state of Illinois. Final report, 3:44878 (PB-274685)
IMAGE SCANNERS/ULTRASONIC WAVES
New developments in ultrasonic imaging of the chest and other body organs, 3:45381 (UCRL-80340(Rev.1))
IMAGES/CONFIGURATION CONTROL
Reconstruction tomography from incomplete projections, 3:45387
IMAGES/TOMOGRAPHY
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
IMMUNE REACTIONS/BIOLOGICAL RADIATION EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
IMPERMEABLE DRY ROCK
See HOT-DRY-ROCK SYSTEMS
IMPINGEMENT/DATA ACQUISITION
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
IMPURITIES/DESORPTION
Laser-induced desorption of impurities from the macrotor tokamak walls, 3:45885
IN CORE INSTRUMENTS
(See also specific instruments.)
IN CORE INSTRUMENTS/NEUTRON DETECTORS
Apparatus for measuring a flux of neutrons (Patent), 3:44623
INCLUSIVE DISTRIBUTION
See INCLUSIVE INTERACTIONS
INCLUSIVE INTERACTIONS
(The group of all interactions of two particles producing a specific final state.)
INCLUSIVE INTERACTIONS/CROSS SECTIONS
Description of the energy dependence of inclusive cross sections in the double-Reggeon representation, 3:45635
INCLUSIVE INTERACTIONS/REGGE POLES
Description of the energy dependence of inclusive cross sections in the double-Reggeon representation, 3:45635
INCOLOY 800/OXIDATION
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
INCONEL ALLOYS/HARDNESS
Development and evaluation of high chromium weld deposited overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Technical status report, January 1-January 31, 1978, 3:45004 (TID-28288)
INCONEL ALLOYS/MICROSTRUCTURE
Development and evaluation of high chromium weld deposited overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Technical status report, January 1-January 31, 1978, 3:45004 (TID-28288)
INCONEL ALLOYS/TENSILE PROPERTIES
Development and evaluation of high chromium weld deposited overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Technical status report, January 1-January 31, 1978, 3:45004 (TID-28288)
INDIUM 111/RADIONUCLIDE KINETICS
Radionuclide computerized tomography for brain study, 3:45388
INDIUM 113/ENERGY LEVELS
Unified description of odd-mass indium nuclei I. General theory and comparison to ^{113}In and ^{115}In levels populated in the decay of ^{113}Sn and $^{115}Cd/sup\ m/,g$, 3:45737
INDIUM 113/NUCLEAR STRUCTURE
Unified description of odd-mass indium nuclei I. General theory and comparison to ^{113}In and ^{115}In levels populated in the decay of ^{113}Sn and $^{115}Cd/sup\ m/,g$, 3:45737
INDIUM 115/ENERGY LEVELS
Unified description of odd-mass indium nuclei I. General theory and comparison to ^{113}In and ^{115}In levels populated in the decay of ^{113}Sn and $^{115}Cd/sup\ m/,g$, 3:45737
INDIUM 115/NUCLEAR STRUCTURE
Unified description of odd-mass indium nuclei I. General theory and comparison to ^{113}In and ^{115}In levels populated in the decay of ^{113}Sn and $^{115}Cd/sup\ m/,g$, 3:45737
INDIUM 122/EXCITED STATES
States of ^{122}In and ^{124}In, 3:45742
INDIUM 124/EXCITED STATES
States of ^{122}In and ^{124}In, 3:45742
INDIUM ALLOYS/CRITICAL CURRENT
Vortex pinning on grain boundaries in Pb-In alloys, 3:45049

INDIUM ALLOYS/GRAIN BOUNDARIES
Vortex pinning on grain boundaries in Pb-In alloys, 3:45049
INDIUM PHOSPHIDES/ELECTRICAL PROPERTIES
Electrical properties of n-type epitaxial indium phosphide films, 3:44367
INDIUM SELENIDES/CHEMICAL COMPOSITION
Auger electron spectroscopy studies of I-III-VI_2 chalcopyrite compounds, 3:45114
INDIUM SULFIDES/CHEMICAL COMPOSITION
Auger electron spectroscopy studies of I-III-VI_2 chalcopyrite compounds, 3:45114
INDIUM TELLURIDES/CHEMICAL COMPOSITION
Auger electron spectroscopy studies of I-III-VI_2 chalcopyrite compounds, 3:45114
INDUCTION LOGGING/DATA ANALYSIS
Experience in application of a probability model for interpreting the results of geological and well logging studies of fractured reservoirs, 3:44149
INDUSTRIAL PLANTS
See also FEED MATERIALS PLANTS
GASEOUS DIFFUSION PLANTS
WASTE PROCESSING PLANTS
INDUSTRIAL PLANTS/AIR POLLUTION CONTROL
Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB-266103)
INDUSTRIAL PLANTS/ENERGY ACCOUNTING
Study of energy conservation potential in the meat packing industry, 3:44954 (FEA/D-76/291)
INDUSTRIAL PLANTS/ENERGY CONSERVATION
Use of the dryer drum. Preprint 2843, 3:44957 (CONF-770448-2)
INDUSTRIAL PLANTS/FLUE GAS
Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB-266103)
Waste flue gas desulfurizing method (Patent), 3:44626
INDUSTRIAL PLANTS/GAS TURBINES
Parameter monitoring for corrosion control of utility gas turbines. Interim report, 3:44613 (EPRI-AF-665)
INDUSTRIAL PLANTS/HEAT LOSSES
Effects of heat leaks on thermal insulation of domestic and industrial buildings, 3:44943
INDUSTRIAL PLANTS/POLLUTION CONTROL EQUIPMENT
Method for removing hydrogen sulfide from sulfur-bearing industrial gases with clause-type reactors (Patent), 3:45236
INDUSTRIAL PLANTS/VENTILATION SYSTEMS
Economy of ventilators in plants with variable volume flow, 3:44949
INDUSTRIAL PLANTS/WASTE HEAT UTILIZATION
Utilization of thermal energy in the plastic industry, 3:44962
INDUSTRIAL WASTES/BIOLOGICAL EFFECTS
Risk-benefit analysis and the economics of heavy metals control, 3:45357
INDUSTRIAL WASTES/ENVIRONMENTAL EFFECTS
Perspectives on the environment, 3:45294 (NP-23191)
Risk-benefit analysis and the economics of heavy metals control, 3:45357
INDUSTRIAL WASTES/ENVIRONMENTAL TRANSPORT
Water resources research program. Pollution of coastal waters off Chicago by sinking plumes from the Indiana Harbor Canal, 3:45327 (ANL/WR-77-2)
INDUSTRIAL WASTES/WASTE MANAGEMENT
Alternatives for hazardous waste management in the inorganic chemicals industry. Final report, September 1976-January 1977, 3:45362 (PB-274565)
INDUSTRIAL WASTES/WASTE PROCESSING
Review of current interest and research in water hyacinth-based wastewater treatment. Final report, 3:44966 (N-77-33683)
INDUSTRY
See also AUTOMOBILE INDUSTRY
CHEMICAL INDUSTRY
COAL INDUSTRY
MEAT INDUSTRY
METAL INDUSTRY
NATURAL GAS INDUSTRY
NUCLEAR INDUSTRY
OIL SHALE INDUSTRY
PAPER INDUSTRY
PETROLEUM INDUSTRY
SNG PLANTS
TEXTILE INDUSTRY
INDUSTRY/CO-GENERATION
Cogeneration of steam and electric power (Book; 4 parts), 3:44870
INDUSTRY/ENERGY DEMAND
Analysis of the final energy demand in individual demand sectors and projection of its future development (German Federal Republic), 3:44881
INDUSTRY/POLLUTION CONTROL
Canadian experience with the reduction of mercury at chlor-alkali plants, 3:45313
INERTIAL CONFINEMENT
Laser interaction and related plasma phenomena. Volume 4a, 3:46119
INFORMATION/MANAGEMENT
Managing the flow of technology: technology transfer and the dissemination of technological information within the R and D organization (Book), 3:44866
INFORMATION SYSTEMS/COST BENEFIT ANALYSIS
Medical information systems (a bibliography with abstracts). Report for February 1964-December 1977, 3:45385 (NTIS/PS-78/0031)
INHOMOGENEOUS PLASMA/ABSOLUTE INSTABILITIES
Threshold for the absolute instability of stimulated Brillouin scattering in a plasma with density and temperature gradients, 3:46072
INHOMOGENEOUS PLASMA/ALFVEN WAVES
Parametric decay of lower hybrid wave into drift waves, 3:46038 (N-77-33988)
INHOMOGENEOUS PLASMA/BRILLOUIN EFFECT
Threshold for the absolute instability of stimulated Brillouin scattering in a plasma with density and temperature gradients, 3:46072
INHOMOGENEOUS PLASMA/CHERENKOV RADIATION
Hydrodynamic Cerenkov instability of inhomogeneous plasma streams, 3:46016
INHOMOGENEOUS PLASMA/DECAY INSTABILITY
Decay of an electromagnetic wave into two plasmons in an inhomogeneous plasma, 3:46018
Hydrodynamic Cerenkov instability of inhomogeneous plasma streams, 3:46016
INHOMOGENEOUS PLASMA/DISTURBANCES
Evolution of slightly localized Alfven quasimodes in a two-component tokamak, 3:46059
INHOMOGENEOUS PLASMA/ELECTROMAGNETIC RADIATION
Equation of polarization transfer in an inhomogeneous magnetized plasma. II. Solutions, 3:46054
Relativistic effects on electromagnetic wave propagation in a cold inhomogeneous electron plasma, 3:46052
INHOMOGENEOUS PLASMA/ION ACOUSTIC WAVES
Excitation of ion-acoustic waves in an inhomogeneous plasma by a train of rf pulses, 3:46068
INHOMOGENEOUS PLASMA/KINETIC EQUATIONS
Lie-operator approach to mode coupling in nonuniform plasma, 3:45957
INHOMOGENEOUS PLASMA/LANDAU DAMPING
Absorption of the lower-hybrid wave in a bounded plasma, 3:46075
INHOMOGENEOUS PLASMA/MAGNETOACOUSTIC WAVES
Coupling to fast eigenmodes in a non-uniform plasma, 3:46046
Effect of refraction on the propagation of magnetosonic waves in an inhomogeneous plasma, 3:46061
INHOMOGENEOUS PLASMA/NONLINEAR PROBLEMS
Lie-operator approach to mode coupling in nonuniform plasma, 3:45957
INHOMOGENEOUS PLASMA/PLASMA WAVES
Finite amplitude Langmuir oscillations in the plasma resonance region, 3:46078
Nonlinear electrostatic ion cyclotron waves in an rf-plugged inhomogeneous plasma slab, 3:45550 (N-77-33990)
INHOMOGENEOUS PLASMA/PLASMONS
Decay of an electromagnetic wave into two plasmons in an inhomogeneous plasma, 3:46018
INHOMOGENEOUS PLASMA/SOLITONS
Langmuir solitons in an inhomogeneous plasma, 3:46067
INHOMOGENEOUS PLASMA/TWO-STREAM INSTABILITY
Theory of electromagnetic instabilities in an inhomogeneous plasma stream with an anisotropic pressure, 3:46023
INHOMOGENEOUS PLASMA/WAVE PROPAGATION
Nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma, 3:46033 (IPPJ-268)
INJECTION WELLS/SENSIBLE HEAT STORAGE
Geothermal storage of solar energy for electric power systems, 3:44558 (CONF-761220-)
IN-SITU COMBUSTION/MAPS
Fossil Energy Development Programs. Quarterly report, October 1-December 31, 1977, 3:44052 (SAND-78-0653)

IN-SITU COMBUSTION/REMOTE SENSING
Remote electromagnetic sensing of underground coal burns. Quarterly technical report, September-November 1977. Interim annual report, 3:44043 (FE-2414-6)
IN-SITU GASIFICATION/BOREHOLE LINKING
Hoe Creek II field experiment on underground coal gasification, preliminary results, 3:44056 (UCRL-80592)
IN-SITU GASIFICATION/DATA ACQUISITION SYSTEMS
Instrumentation and process control development for in situ coal gasification. Twelfth quarterly report, September-November 1977, 3:44051 (SAND-78-0253)
IN-SITU GASIFICATION/EFFICIENCY
LLL in situ coal gasifiction program. Annual report Fiscal Year 1977, October 1976-September 1977 (Hoe Creek No 1 and 2), 3:44055 (UCRL-50032-77)
IN-SITU GASIFICATION/EXPLOSIVE FRACTURING
LLL in situ coal gasifiction program. Annual report Fiscal Year 1977, October 1976-September 1977 (Hoe Creek No 1 and 2), 3:44055 (UCRL-50032-77)
IN-SITU GASIFICATION/FEASIBILITY STUDIES
In-situ gasification of coal, 3:44058
IN-SITU GASIFICATION/GROUND SUBSIDENCE
Fossil Energy Development Programs. Quarterly report, October 1-December 31, 1977, 3:44052 (SAND-78-0653)
IN-SITU GASIFICATION/HEAT LOSSES
Hoe Creek II field experiment on underground coal gasification, preliminary results, 3:44056 (UCRL-80592)
IN-SITU GASIFICATION/MATHEMATICAL MODELS
High-temperature CO_2/O_2-coal reaction rate experiments (420 to 603°C), 3:44050 (LA-7277-MS)
IN-SITU GASIFICATION/REMOTE SENSING
Remote electromagnetic sensing of underground coal burns. Quarterly technical report, September-November 1977. Interim annual report, 3:44043 (FE-2414-6)
IN-SITU GASIFICATION/RESEARCH PROGRAMS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
IN-SITU GASIFICATION/REVIEWS
In-situ gasification of coal, 3:44058
IN-SITU GASIFICATION/SEISMIC SURVEYS
Instrumentation and process control development for in situ coal gasification. Twelfth quarterly report, September-November 1977, 3:44051 (SAND-78-0253)
INSULATION (THERMAL)
See THERMAL INSULATION
INTAKE CANALS/SITE SELECTION
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
INTAKE STRUCTURES/DESIGN
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
INTAKE STRUCTURES/ENVIRONMENTAL EFFECTS
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
INTEGRAL EQUATIONS/EIGENFUNCTIONS
Solution of a second-order integro-differential equation which occurs in laser modelocking, 3:45867
INTEGRATED CIRCUITS/COMPUTER-AIDED DESIGN
LCL: a compiler and language for logical mask checking, 3:45229 (SAND-77-2031)
INTERCHANGE INSTABILITY
See FLUTE INSTABILITY
INTERFACES/ELECTRONIC STRUCTURE
Interface states at the Ga-GaAs interface, 3:45083
INTERFEROMETERS
FIR-interferometer for JT-60, 3:45901 (JAERI-M-7121)
INTERMEDIATE MASS NUCLEI/HEAVY ION REACTIONS
Statistical-model analyses of heavy-ion-induced fusion reaction products, 3:45738
INTERNAL COMBUSTION ENGINES
See also STRATIFIED CHARGE ENGINES
INTERNAL COMBUSTION ENGINES/FUEL SYSTEMS
Additional air control device for an internal combustion engine (Patent), 3:44974
Air-to-fuel ratio controlling system for internal combustion engines (Patent), 3:44978
Engine air-to-fuel ratio control system (Patent), 3:44976
Fuel metering device (Patent), 3:44975
INTERNAL COMBUSTION ENGINES/POLLUTION CONTROL EQUIPMENT
Additional air control device for an internal combustion engine (Patent), 3:44974
Air-to-fuel ratio controlling system for internal combustion engines (Patent), 3:44978
Engine air-to-fuel ratio control system (Patent), 3:44976
Fuel metering device (Patent), 3:44975
INTERNAL COMBUSTION ENGINES/SPEED REGULATORS
Speed control apparatus for an internal combustion engine (Patent), 3:44977
INTERNAL COMBUSTION ENGINES/TECHNOLOGY ASSESSMENT
Compendium of critiques of JPL report SP-43-17: automotive technology status and projections project, 3:44969 (N-77-33519)
INTERNAL CONTAMINATION
See RADIONUCLIDE KINETICS
INTERPLANETARY MAGNETIC FIELDS
Sources of magnetic fields in recurrent interplanetary streams, 3:45478 (N-77-34091)
INTERPLANETARY MAGNETIC FIELDS/SPACE DEPENDENCE
Heliocentric distance dependence of the interplanetary magnetic field, 3:45475 (N-77-34068)
INTERPLANETARY MAGNETIC FIELDS/TABLES
Interplanetary medium data book, 3:45473 (N-77-34065)
Interplanetary medium data book, appendix, 3:45474 (N-77-34066)
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
INTERPLANETARY MAGNETIC FIELDS/TIME DEPENDENCE
Heliocentric distance dependence of the interplanetary magnetic field, 3:45475 (N-77-34068)
INTERPLANETARY SPACE/PROTON DENSITY
Interplanetary medium data book, appendix, 3:45474 (N-77-34066)
INTERPLANETARY SPACE/PROTON TEMPERATURE
Interplanetary medium data book, appendix, 3:45474 (N-77-34066)
INTERSTELLAR SPACE/HYDROGEN
Collisional excitation of interstellar molecules: H_2, 3:45537
INTERSTELLAR SPACE/HYDROGEN DEUTERIDE
Infrared emission of interstellar HD molecules, 3:45465
INTESTINAL ABSORPTION/AGE DEPENDENCE
Gastrointestinal absorption and distribution of ^{144}Ce in the suckling pig, 3:45405
INTESTINAL ABSORPTION/RADIONUCLIDE KINETICS
Gastrointestinal absorption and distribution of ^{144}Ce in the suckling pig, 3:45405
INVERTEBRATES
See also ANNELIDS
MOLLUSCS
INVERTEBRATES/GROWTH
No. 2 fuel oil spill in Bourne, Massachusetts: immediate assessment of the effects of marine invertebrates and a 3-year study of growth and recovery of a salt marsh, 3:44182
IODIDES/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
IODINATED ALIPHATIC HYDROCARBONS/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_2Br, 3:45527
IODINE/EMISSION SPECTRA
Pseudopotential study of some prominent band systems of the spectra of the I_2 molecule, 3:45505
IODINE/THERMOCHEMICAL PROCESSES
Thermochemical process for producing methane and oxygen (Patent), 3:44331
IODINE 129/RADIATION MONITORING
Measurement of the distribution of ^{129}I in and its discharge from the Karlsruhe Reprocessing Plant, 3:44303 (BNWL-tr-311)
IODINE 129/RADIOACTIVE WASTE PROCESSING
Measurement of the distribution of ^{129}I in and its discharge from the Karlsruhe Reprocessing Plant, 3:44303 (BNWL-tr-311)
IODINE 131/RADIATION MONITORING
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
IODINE 131/RADIOECOLOGICAL CONCENTRATION
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
IODINE ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
ION ACOUSTIC WAVES/DISPERSION RELATIONS
Measurements of dispersion relation of waves in a turbulently heated plasma by microwave scattering method, 3:46035 (IPPJ-291)
ION ACOUSTIC WAVES/ELECTRON DENSITY
Electron-flux limitation due to ion acoustic instability, 3:46080
ION ACOUSTIC WAVES/EXCITATION
Ion wave excitation by radiation pressure in a plasma waveguide, 3:46053
ION ACOUSTIC WAVES/MODULATION
Nonlinear self-modulation of ion-acoustic waves, 3:46034 (IPPJ-289)

ION ACOUSTIC WAVES/SIMULATION
Computer simulations on the nonlinear frequency shift and nonlinear modulation of ion-acoustic waves, 3:45874 (N-77-33983)
ION ACOUSTIC WAVES/SOLITONS
Excitation of an ion-acoustic soliton by high-frequency waves in a collisionless plasma with a two-temperature electron gas, 3:46066
ION ACOUSTIC WAVES/WAVE PROPAGATION
Propagation of nonlinear ion acoustic wave with generation of long-wavelength waves, 3:46041 (N-77-34005)
ION BEAMS/BEAM NEUTRALIZATION
Fast neutralization of ion beams in the presence of transverse magnetic fields, 3:45247
ION BEAMS/FOCUSING
New lens system using toroidal magnetic field for intense ion beams, 3:46107 (N-77-33981)
ION PLASMA WAVES/PERTURBATION THEORY
Contribution of higher order terms in the reductive perturbation theory. 2. A case of strongly dispersive wave, 3:46039 (N-77-33992)
ION SOURCES
See also ALPHA SOURCES
NEUTRAL BEAM SOURCES
ION SOURCES/BEAM OPTICS
Effect of preacceleration voltage upon ion-beam divergence, 3:45250
ION SOURCES/DESIGN
Reflex tetrode with unidirectional ion flow. Interim report, 3:45500 (AD-A-048751)
ION SOURCES/EFFICIENCY
Effect of preacceleration on intense ion-beam transmission efficiency, 3:46103
ION SOURCES/HYDROGEN IONS 1 MINUS
Use of a Hall accelerator in the production of negative hydrogen ions in cesium vapor, 3:46106
ION WAVE INSTABILITY/INSTABILITY GROWTH RATES
Current-driven instabilities in a laminar perpendicular shock, 3:45488
ION-ATOM COLLISIONS/ELECTRON CAPTURE
Target-thickness dependence of radiative electron capture in heavy-ion collisions, 3:45529
ION-ATOM COLLISIONS/ION SCATTERING ANALYSIS
Application of a double-pass CMA to ion scattering from some actinide materials, 3:45012
IONIZATION CHAMBERS
See also ELECTRON-CAPTURE DETECTORS
IONIZATION CHAMBERS/COMPARATIVE EVALUATIONS
Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison, 3:45827 (BNL-24330)
IONIZATION CHAMBERS/DESIGN
Electroradiographic device (Patent), 3:45257
Ionization detectors with iron-55 as a radioactive source, 3:45265
IONOSPHERE/ELECTRON DENSITY
Tables of ionospheric electron contant hourly values for Armidale, Australia for the period May 1970 through June 1975. Final report, 1 July 1973-30 July 1975, 3:45480 (AD-A-047287)
IONOSPHERE/PLASMA DRIFT
Tordo 1 polar cusp barium plasma injection experiment, 3:45484
IRIDIUM 189/ENERGY LEVELS
Levels in ^{189}Ir and ^{191}Ir observed in the (p,t) reaction, 3:45747
IRIDIUM 191/ENERGY LEVELS
Levels in ^{189}Ir and ^{191}Ir observed in the (p,t) reaction, 3:45747
IRIDIUM 191 TARGET/PROTON REACTIONS
Levels in ^{189}Ir and ^{191}Ir observed in the (p,t) reaction, 3:45747
IRIDIUM 193 TARGET/PROTON REACTIONS
Levels in ^{189}Ir and ^{191}Ir observed in the (p,t) reaction, 3:45747
IRON/CHARGED-PARTICLE TRANSPORT
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
IRON/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
IRON/EMBRITTLEMENT
Ion-beam investigation of Sb diffusion and solubility in Fe, 3:45023
IRON/GAMMA SPECTRA
Secondary gamma radiation study in reactor shielding, 3:44769
IRON/NEUTRON REACTIONS
Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron (Cross sections, neutron and gamma spectra), 3:45718
IRON/NEUTRON SPECTRA
Integral data for the prediction of neutron propagation in iron-sodium mixtures, 3:44705
Two-dimensional shielding benchmarks for sodium and iron at Yayoi, 3:44707
IRON/NEUTRON TRANSPORT
Sensitivity analysis for shielding data evaluation by interactive graphics computing, 3:45823
IRON/PHOTON TRANSPORT
Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron (Cross sections, neutron and gamma spectra), 3:45718
IRON/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
IRON 54 TARGET/OXYGEN 18 REACTIONS
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
IRON 56/ENERGY LEVELS
Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu (Wood-Saxon and Nilsson potentials, spin-cutoff parameters, m value, π, J, partition function inversion), 3:45717
IRON 56 TARGET/NEUTRON REACTIONS
Particle-vibrator model for intermediate structure in neutron scattering from ^{5}6Fe, 3:45719
IRON 56 TARGET/OXYGEN 16 REACTIONS
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
IRON 57/ENERGY-LEVEL TRANSITIONS
Yrast decay schemes from heavy-ion + ^{4}8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
IRON 57/HIGH SPIN STATES
Yrast decay schemes from heavy-ion + ^{4}8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
IRON 57/YRAST STATES
Yrast decay schemes from heavy-ion + ^{4}8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
IRON 58/ENERGY-LEVEL TRANSITIONS
Yrast decay schemes from heavy-ion + ^{4}8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
IRON 58/HIGH SPIN STATES
Yrast decay schemes from heavy-ion + ^{4}8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
IRON 58/YRAST STATES
Yrast decay schemes from heavy-ion + ^{4}8Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
IRON 60/ENERGY LEVELS
Mass and β decay of the new neutron-rich isotope ^{60}Mn, 3:45729
IRON ALLOYS
See also IRON BASE ALLOYS
STEELS
IRON ALLOYS/CORROSION
Potentiostatic study on anodic behavior of iron-chromium alloys, 3:45054 (ORNL-tr-4622)
IRON ALLOYS/FABRICATION
Production of aluminum-silicon alloy and ferrosilicon and commercial purity aluminum by the direct reduction process. First quarterly progress report, 1 September 1977-30 November 1977, 3:45003 (TID-28260)
IRON ALLOYS/FRACTURE PROPERTIES
Analysis of the ductile-brittle transition temperature in Fe-binary alloys. Final report, May 1974-July 1977, 3:45015 (TID-28431)
IRON BASE ALLOYS/CORROSION RESISTANCE
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June-31 August 1977, 3:45053 (FE-2299-15)
IRON BASE ALLOYS/HYPERFINE STRUCTURE
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
IRON BASE ALLOYS/ISOMER SHIFT
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
IRON BASE ALLOYS/MAGNETOSTRICTION
Effect of magnetically aligned powder on the magnetostriction of sintered rare earth-iron Laves phase compounds, 3:45022
IRON CHLORIDES/CATALYTIC EFFECTS
Study of the physicochemical properties of activated coke, 3:44084
IRON ISOTOPES/NEUTRON REACTIONS
Perturbation formalism for the complex poles and widths of the transition matrix with an application to intermediate structure phenomena, 3:45720
IRON METEORITES/CHEMICAL COMPOSITION
Silicate petrography and origin of the mesosiderites: a preliminary investigation of their relationships to the howardite-eurite-diogenite suite, 3:45434 (CONF-780314-2)

IRON METEORITES/IMPACT SHOCK
Two-dimensional computer simulation of hypervelocity impact cratering: some preliminary results for Meteor Crater, Arizona, 3:45433 (UCRL-80539)
IRON OXIDES/ENVIRONMENTAL TRANSPORT
Role of hydrous metal oxides in the transport of heavy metals in the environment (Fe, Mn, Cu, Zn, Ni, Cd), 3:45345
IRON OXIDES/STABILITY
Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system (SiO_2-B_2O_3-Na_2O-CaO-Al_2O_3-Fe_2O_3), 3:44299 (ORNL-tr-4632)
IRON OXIDES/X-RAY FLUORESCENCE ANALYSIS
Reduction in the error of determining the ash content of coal by the radioisotope method, 3:44081
IRRADIATION CAPSULES/FABRICATION
Manufacturing of a double-wall reactor insert by using special equipment for monitoring the strains and stresses caused by welding, 3:44764
IRRADIATION PLANTS/DESIGN
Mobile prompt-gamma in vivo neutron activation facility (^{238}Pu, Be), 3:45379 (BNL-24290)
IRRADIATION PLANTS/SAFETY ENGINEERING
Report to Congress on abnormal occurrences, October-December 1977, 3:45427 (NUREG-0090-10)
IRRIGATION/SOLAR WATER PUMPS
Solar powered irrigation: present status and future outlook, 3:44468 (SAND-78-0016C)
ISOTOPE ENRICHMENT
See ISOTOPE SEPARATION
ISOTOPE RATIO/ISOTOPE RATIO
Natural gases in the south German Molasse Basin. Application of D/H and $^{13}C/^{12}C$ isotope analyses to deduce their origin, 3:44194
ISOTOPE SEPARATION
(For separation of isotopes of the same element only.)
ISOTOPE SEPARATION/FEASIBILITY STUDIES
Study of solar assisted thermal diffusion separating systems for isotopic fuels, 3:44320 (CONF-761220-)
ISOTOPE SEPARATION/SOLAR HEATING
Study of solar assisted thermal diffusion separating systems for isotopic fuels, 3:44320 (CONF-761220-)
ITALY/GEOTHERMAL ENERGY
Report of geothermal multi-purpose utilization inspection tour, 3:44571 (NP-22301)

J

J-3105 RESONANCES
See PSI-3105 RESONANCES
JAPAN
See also HATCHOBARU GEOTHERMAL FIELD
JAPAN/GEOCHEMICAL SURVEYS
Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields, 3:44586 (CONF-7410177-3)
JAPAN/GEOTHERMAL EXPLORATION
Geochemical geothermal exploration in Noya geothermal field, 3:44587 (CONF-7610123-5)
JAPAN/GEOTHERMAL FIELDS
Geochemical geothermal exploration in Noya geothermal field, 3:44587 (CONF-7610123-5)
JAPAN/HOT SPRINGS
Analysis of interrelation of hot spring waters using a multi-component concentration correlation matrix, 3:44574 (CONF-7610123-6)
Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP-22298)
JAPAN/HOT-DRY-ROCK SYSTEMS
Rock drilling and crushing methods: congealing crush of hot dry rock, 3:44595 (CONF-770754-1)
JAPAN/VOLCANOES
Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP-22298)
JFT-2 TOKAMAK/NEUTRAL ATOM BEAM INJECTION
JFT-2 tokamak neutral injector and preliminary results of additional heating experiment, 3:46102 (JAERI-M-7043)
JOSEPHSON EFFECT/OSCILLATIONS
Transition from relaxational to "Josephson" oscillations in shunted superconducting bridges, 3:45145
JT-60 REACTORS/EDDY CURRENTS
Three-dimensional analysis of eddy current with the finite element method, 3:46095 (JAERI-M-7062)
JT-60 REACTORS/LIMITERS
Simulation of drive characteristics of JT-60 movable limiter, 3:46125 (JAERI-M-7130)
JT-60 REACTORS/PLASMA DIAGNOSTICS
Diagnostic planning in JT-60 project, 3:45902 (JAERI-M-7220)
FIR-interferometer for JT-60, 3:45901 (JAERI-M-7121)
JUPITER PLANET/SATELLITES
Report of the terrestrial bodies science working group. Volume 7. The Galilean satellites (Formation and evolution), 3:45477 (N-77-34080)

K

K MATRIX/FOUR-BODY PROBLEM
Microscopic K-matrix approach to the continuous spectrum in the four-nucleon problem, 3:45787
KANSAS/URANIUM DEPOSITS
Interpretation of uranium content of ground water in west-central Kansas, 3:44231 (USGS-CIRC-753)
KANUPP REACTOR/REACTOR MAINTENANCE
Support required from Canada in the operation and maintenance of CANDU stations overseas, 3:44677 (CONF-760688-)
KANUPP REACTOR/REACTOR OPERATION
Support required from Canada in the operation and maintenance of CANDU stations overseas, 3:44677 (CONF-760688-)
KAON MINUS-PROTON INTERACTIONS/CHARGE-EXCHANGE INTERACTIONS
Differential cross section of the reaction $K^- p \rightarrow K\text{-bar}^0 n$ from 515 to 956 MeV/c, 3:45584
Total cross section of the reaction $K^- p \rightarrow K\text{-bar}^0 n$ from 515 to 1065 MeV/c, 3:45583
KAON MINUS-PROTON INTERACTIONS/DIFFERENTIAL CROSS SECTIONS
Differential cross section of the reaction $K^- p \rightarrow K\text{-bar}^0 n$ from 515 to 956 MeV/c, 3:45584
KAON MINUS-PROTON INTERACTIONS/TOTAL CROSS SECTIONS
Total cross section of the reaction $K^- p \rightarrow K\text{-bar}^0 n$ from 515 to 1065 MeV/c, 3:45583
KAONIC ATOMS/CONFIGURATION MIXING
Radiationless mixing in kaonic atoms, 3:45520
KAPITZA RESISTANCE/SIMULATION
One-dimensional Kapitza conductance: Comparison of the phonon mismatch theory with computer experiments, 3:45556
KARACHI NUCLEAR POWER PLANT
See KANUPP REACTOR
KARLSRUHE NUCLEAR RESEARCH CENTER
See KERNFORSCHUNGSZENTRUM KARLSRUHE
KENTUCKY/ENERGY SOURCES
Kentucky energy resource utilization program. Semiannual report, 1 January-30 June 1977, 3:44863 (PB-274408)
KENTUCKY/RESOURCES
Kentucky energy resource utilization program. Semiannual report, 1 January-30 June 1977, 3:44863 (PB-274408)
KERNFORSCHUNGSZENTRUM KARLSRUHE/SAFEGUARDS
Annual report of the Nuclear Safeguards Project 1976, 3:44307 (KFK-2465)
KERNKRAFTWERK RWE-BAYERNWERK
See RWE-BAYERNWERK REACTOR
KEROGEN/ISOTOPE RATIO
Stable carbon isotope ratios and chemical properties of kerogen and extractable organic matter in prephanerozoic and phanerozoic sediments: their interrelations and possible paleobiological significance, 3:44209
KEROSENE/SEPARATION PROCESSES
Method for the separation of high-boiling hydrocarbons in normal paraffins and branch-chain hydrocarbons on molecular sieves, 3:44167
KETONES/PHOTOLYSIS
Direct detection of the biradicals generated in the Norrish type II reaction (Photolysis of phenyl alkyl ketones), 3:45124
K-HARMONICS METHOD/REVIEWS
Method of K harmonics and the shell model, 3:45811
KIDNEYS/METABOLISM
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
KINETICS EQUATION (REACTOR)
See REACTOR KINETICS EQUATIONS
KINK INSTABILITY/STABILIZATION
Saturation of kink instability and helical equilibrium of current carrying plasma column, 3:45990 (N-77-33993)

KNOCK-ON ELECTRONS
See ELECTRONS
KRB REACTOR
See RWE-BAYERNWERK REACTOR
KRYPTON/ATOM-ATOM COLLISIONS
Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H, 3:45525
KRYPTON/ATOM-MOLECULE COLLISIONS
Collision-induced ion-pair formation of CsCl and Cs_2Cl_2, 3:45526
KRYPTON/DIMERS
Photoelectron spectra of Ar_2 and Kr_2 and dissociation energies of the rare gas dimer ions, 3:45490
KRYPTON/DISSOCIATION ENERGY
Photoelectron spectra of Ar_2 and Kr_2 and dissociation energies of the rare gas dimer ions, 3:45490
KRYPTON 85/TRACER TECHNIQUES
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP-1469)
KRYPTON 86 REACTIONS/COULOMB SCATTERING
Coulomb-nuclear interference for high-spin states excited by ^{86}Kr, ^{40}Ar, and ^{16}O projectiles, 3:45748
KRYPTON 86 REACTIONS/DEEP INELASTIC SCATTERING
Elastic and deeply inelastic reactions in the ^{86}Kr + ^{139}La system at 505, 610, and 710 MeV, 3:45734
Gamma-ray multiplicity moments from deeply inelastic collisions of ^{86}Kr and ^{144}Sm, 3:45745
Measurement of the energy division versus mass in highly damped reactions, 3:45746
Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
KRYPTON 86 REACTIONS/ELASTIC SCATTERING
Elastic and deeply inelastic reactions in the ^{86}Kr + ^{139}La system at 505, 610, and 710 MeV, 3:45734
KRYPTON 86 REACTIONS/FISSION
Evidence for angular momentum depolarization and for enhanced sequential fission in the reaction ^{197}Au(^{86}Kr, Z_3f), 3:45760
KRYPTON 86 REACTIONS/QUASI-FISSION
Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
KRYPTON FLUORIDES/ELECTRONIC STRUCTURE
Covalent and ionic states of the rare gas monofluorides, 3:45174

L

LABELLED COMPOUNDS
See also RADIOPHARMACEUTICALS
LABELLED COMPOUNDS/CHEMICAL PREPARATION
Radiopharmaceuticals (Book), 3:45391
LABORATORY EQUIPMENT
See also HOT CELLS
LABORATORY EQUIPMENT/AUTOMATION
Feasibility study for computerized automation of EPA Region II Technical Support Branch, 3:45303 (UCRL-52426)
LABORATORY EQUIPMENT/DISSOLUTION
Apparatuses for the dissolution of resistent nuclear fuel for analytical sample preparation, 3:44265 (AIAU-77503)
LAKE MICHIGAN/TEMPERATURE MEASUREMENT
Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes, 3:45360 (ANL/WR-77-3)
LAKE MICHIGAN/THERMAL POLLUTION
Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes, 3:45360 (ANL/WR-77-3)
LAKES
See also LAKE MICHIGAN
LAKES/POLLUTION
Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
LAMINOGRAPHY
See TOMOGRAPHY
LAND POLLUTION CONTROL/GOVERNMENT POLICIES
Environmental quality control - governmental finances: fiscal year 1974-1975. State and local government special studies, 3:45299 (PB-275760)
LAND USE/MANAGEMENT
Massachusetts coastal zone management program. Volume I, 3:45325 (PB-274031)
LAND USE/PLANNING
Perspectives on the environment, 3:45294 (NP-23191)
LANGMUIR PROBE/PERFORMANCE
Probe diagnostics of a low-temperature plasma in a magnetic field. I. Experimental procedure and determination of the plasma density, 3:45926
LANGUAGES (PROGRAMMING)
See PROGRAMMING LANGUAGES
LANTHANIDES
See RARE EARTHS
LANTHANUM 139 TARGET/KRYPTON 86 REACTIONS
Elastic and deeply inelastic reactions in the ^{86}Kr + ^{139}La system at 505, 610, and 710 MeV, 3:45734
LANTHANUM ALLOYS/HYPERFINE STRUCTURE
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
LANTHANUM ALLOYS/**ISOMER SHIFT**
Moessbauer effect studies in iron containing nonmagnetic impurities, 3:45020 (N-77-34018)
LANTHANUM FLUORIDES/ENTHALPY
Thermodynamics of the lanthanide trifluorides. I. The heat capacity of lanthanum trifluoride, LaF_3 from 5 to 350°K and enthalpies from 298 to 1477°K, 3:44998
LANTHANUM FLUORIDES/**SPECIFIC HEAT**
Thermodynamics of the lanthanide trifluorides. I. The heat capacity of lanthanum trifluoride, LaF_3 from 5 to 350°K and enthalpies from 298 to 1477°K, 3:44998
LARDERELLO GEOTHERMAL FIELD/GEOPHYSICAL SURVEYS
Seismic research in the Larderello area: first results, 3:44580 (NP-22785)
LARDERELLO GEOTHERMAL FIELD/**SEISMIC SURVEYS**
Seismic research in the Larderello area: first results, 3:44580 (NP-22785)
LASER CAVITIES/LASER MIRRORS
Laser cavity with low-reflectance output mirror and reduced radiation loading on the element, 3:45199
LASER CAVITIES/**RAMAN SPECTRA**
Efficient intracavity laser Raman spectrometer, 3:45181
LASER FUSION REACTORS/FUEL CYCLE
Basic requirements of laser fusion power production and laser fusion-fission plutonium breeding, 3:46105
LASER FUSION REACTORS/**OPTICAL SYSTEMS**
Repetitive output laser system and method using target reflectivity (Patent), 3:46109
LASER FUSION REACTORS/**RESEARCH PROGRAMS**
Fusion laser development at the Lawrence Livermore Laboratory, 3:46123
LASER FUSION REACTORS/**TARGETS**
Simple manipulator for rotating spheres, 3:46129
LASER FUSION REACTORS/**WALL LOADING**
Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL-13801)
LASER IMPLOSIONS
Comments on the paper by K.A. Brueckner and R.S. Janda 'Wavelength dependence of laser coupling to pellet implosions' Nucl. Fusion 17(2) (1977) 305, 3:46111
Laser interaction and related plasma phenomena. Volume 4a, 3:46119
Reply by K.A. Brueckner on comments by E. Panarella on the paper 'Wavelength dependence of laser coupling to pellet implosions' by K.A. Brueckner and R.S. Janda, Nucl. Fusion 17(2) (1977) 305, 3:46110
LASER IMPLOSIONS/**FOCUSING**
Exploding pusher experiments utilizing a 4π illumination system, 3:46118
LASER IMPLOSIONS/**MATHEMATICAL MODELS**
Elementary analysis of fusion implosions, 3:46117
LASER IMPLOSIONS/**NEUTRON EMISSION**
Laser driven compression and neutron generation with spherical shell targets, 3:46116
LASER IMPLOSIONS/**REVIEWS**
Laser fusion experiments at 2 TW, 3:46114
LASER MATERIALS/FABRICATION
Manufacturing methods and technology engineering for neodymium-doped YAG laser rods. Quarterly progress report No. 2, 1 June-31 August 1977, 3:45160 (AD-A-048662)
LASER-PRODUCED PLASMA/ABSORPTION
Absorption of laser radiation in the deionization stage of a laser spark, 3:45987
LASER-PRODUCED PLASMA/**CONTROL SYSTEMS**
High-temperature high-quality deuterium plasma production by laser beams and interactions with magnetic fields, 3:46122
LASER-PRODUCED PLASMA/**DETONATION WAVES**
Electric field of a laser spark ignited near a conducting target, 3:45985
LASER-PRODUCED PLASMA/**ELECTRIC FIELDS**
Electric field of a laser spark ignited near a conducting target, 3:45985

LASER-PRODUCED PLASMA/ELECTRON COLLISIONS
Effect of collisions on the intensities of the dielectron satellites of resonance lines of hydrogenlike ions, 3:45928
LASER-PRODUCED PLASMA/ELECTRON SPECTRA
Laser plasma interactions at 10.6 μm wavelengths, 3:46115
LASER-PRODUCED PLASMA/ELECTRON TEMPERATURE
Time evolution of the electron temperature in a laser-produced carbon plasma, 3:45915
LASER-PRODUCED PLASMA/ENERGY LOSSES
Tamper temperature and compression from simultaneous proton and alpha-particle measurements in laser fusion experiments, 3:45906
LASER-PRODUCED PLASMA/ENERGY TRANSFER
Energy-transport experiments in 10-μm laser-produced plasmas, 3:45909
LASER-PRODUCED PLASMA/HARMONICS
Generation of (3/2) ω_0 in a laser-produced plasma, 3:46058
LASER-PRODUCED PLASMA/IMPURITIES
Laser-produced plasma of two-component mixtures, 3:45988
LASER-PRODUCED PLASMA/IONIZATION
Laser-produced plasma of two-component mixtures, 3:45988
Residual ionization in the expansion of a laser-produced plasma, 3:45964
LASER-PRODUCED PLASMA/MAGNETIC FIELDS
Studies of spontaneous magnetic fields in laser-produced plasmas by faraday rotation, 3:45914
LASER-PRODUCED PLASMA/MATHEMATICAL MODELS
Simplified theoretical model of laser-produced spherical plasma, 3:46113
LASER-PRODUCED PLASMA/P STATES
Effect of collisions on the intensities of the dielectron satellites of resonance lines of hydrogenlike ions, 3:45928
LASER-PRODUCED PLASMA/PLASMA DIAGNOSTICS
Characterization of a laser-produced negative-hydrogen-ion plasma, 3:45911
CO_2 laser-plasma interaction studies at NRC-Canada, 3:45930
Photographic study of rapid events by picosecond techniques, 3:45904 (N-77-33495)
Studies of spontaneous magnetic fields in laser-produced plasmas by faraday rotation, 3:45914
Suprathermal electrons in a laser-heated plasma: a theoretical temperature relationship, 3:45929
Ultrahigh speed diagnostics of the parameters of laser plasma corona, 3:45918
LASER-PRODUCED PLASMA/PLASMA EXPANSION
Residual ionization in the expansion of a laser-produced plasma, 3:45964
LASER-PRODUCED PLASMA/PLUGGING
Report on radio frequency plugging research (3rd report), 3:45888 (UCRL-Trans-11347)
LASER-PRODUCED PLASMA/SHOCK WAVES
Thermonuclear reaction wave in high-density plasma, 3:45899
LASER-PRODUCED PLASMA/TEMPERATURE EFFECTS
Mirror-damage thresholds for laser-fusion pulse shapes, 3:46128
LASER-PRODUCED PLASMA/X-RAY SPECTRA
Plasma x-ray emission produced by ruby lasers at 10^{12} W/cm^2, 3:45908
LASER-RADIATION HEATING/PARAMETRIC INSTABILITIES
Saturation of the parametric instability in a strong electromagnetic field, 3:46025
LASER-RADIATION HEATING/PLASMA DIAGNOSTICS
Suprathermal electrons in a laser-heated plasma: a theoretical temperature relationship, 3:45929
LASER-RADIATION HEATING/RECOMBINATION
Residual ionization in the expansion of a laser-produced plasma, 3:45964
LASER-RADIATION HEATING/RESONANCE ABSORPTION
Resonant absorption of laser light by a magnetized plasma, 3:45887
LASERS
See also CARBON DIOXIDE LASERS
CARBON MONOXIDE LASERS
CHEMICAL LASERS
DYE LASERS
GAMMA-RAY LASERS
GAS LASERS
NEODYMIUM LASERS
SEMICONDUCTOR LASERS
SOLID STATE LASERS
X-RAY LASERS
Laser interaction and related plasma phenomena. Volume 4a, 3:46119
LASERS/ABSORPTION
Stimulated emission and absorption in classical systems, 3:45863
LASERS/BIOLOGICAL RADIATION EFFECTS
Biological effects of laser radiation (a bibliography with abstracts). Report for 1964-January 1978, 3:45397 (NTIS/PS-78/0036)
LASERS/MATHEMATICAL MODELS
Observable manifestations of phase transitions in lasers, 3:45187
LASERS/MODE LOCKING
Solution of a second-order integro-differential equation which occurs in laser modelocking, 3:45867
LASERS/OPTICAL PUMPING
Flash bulb (Patent), 3:45210
LASERS/OPTICAL SYSTEMS
Laser damage phenomenology in materials, 3:46120
LASERS/STIMULATED EMISSION
Stimulated emission and absorption in classical systems, 3:45863
LASL
(Los Alamos Scientific Laboratory.)
LASL/CHEMICAL EFFLUENTS
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
LASL/ENVIRONMENTAL IMPACTS
Draft environmental impact statement. Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico, 3:45324 (DOE/EIS-0018-D)
LASL/RADIOACTIVE EFFLUENTS
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
LASL/WASTE MANAGEMENT
Draft environmental impact statement. Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico, 3:45324 (DOE/EIS-0018-D)
LATENT HEAT STORAGE
Application of latent-heat storage element in solar-heated buildings, 3:44557
Solar heating system for greenhouses using LAING latent-energy storages, 3:44568
LATENT HEAT STORAGE/ENERGY CONSERVATION
Energy cost reduction by latent heat buffers, 3:44844
LATENT HEAT STORAGE/HEAT TRANSFER
Heat exchange processes for latent heat storage devices, 3:44845
LATENT HEAT STORAGE/MATERIALS
Development of latent heat of fusion type materials, 3:44562 (CONF-761220-)
Selection criteria and properties of materials for latent storage of thermal energy, 3:44843
LATENT HEAT STORAGE/THERMAL ANALYSIS
Prediction of melting rate in a solar energy storage sub-system utilizing latent heat, 3:44563 (CONF-761220-)
LATHES/DESIGN
Design and construction of Diamond Turning Machine No. 3, 3:45135 (UCRL-50016-78-1)
LATTICES (REACTOR)
See REACTOR LATTICES
LAVA/QUARKS
Search for fractionally charged particles in sea water, ocean sediment deposits, and volcanic lava, 3:45557
LAWRENCE BERKELEY LABORATORY/COMPUTERS
Computer performance management at LBL, 3:46141 (UCID-3994)
LEAD/ADSORPTION
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
LEAD/BIOLOGICAL ACCUMULATION
Accumulation and excretion of heavy metals in organisms (/sup 115m/Cd, ^{203}Hg, Pb), 3:45378
LEAD/BIOLOGICAL EFFECTS
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
Risk-benefit analysis and the economics of heavy metals control, 3:45357
LEAD/COST BENEFIT ANALYSIS
Risk-benefit analysis and the economics of heavy metals control, 3:45357
LEAD/DEFORMATION
Temperature dependence of plastic deformation rate in lead at the superconducting transition, 3:45018
LEAD/ECOLOGICAL CONCENTRATION
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume IV. Appendices. Final report, May 1974-April 1977, 3:45365 (PB-276172)
LEAD/ECONOMICS
Risk-benefit analysis and the economics of heavy metals control, 3:45357
LEAD/ENVIRONMENTAL EFFECTS
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
Risk-benefit analysis and the economics of heavy metals control, 3:45357

LEAD/ENVIRONMENTAL TRANSPORT
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
LEAD/GAMMA SPECTRA
Secondary gamma radiation study in reactor shielding, 3:44769
LEAD/MAXIMUM PERMISSIBLE CONCENTRATION
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
LEAD/STRAIN SOFTENING
Concentration dependence of the softening effect in Pb-Sn and Pb-Bi alloys at the superconducting transition point, 3:45019
LEAD/SUPERCONDUCTIVITY
Concentration dependence of the softening effect in Pb-Sn and Pb-Bi alloys at the superconducting transition point, 3:45019
Temperature dependence of plastic deformation rate in lead at the superconducting transition, 3:45018
LEAD/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
LEAD/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
LEAD 199/ENERGY LEVELS
Nuclear Data Sheets for A=199, 3:45756
LEAD 199/NUCLEAR STRUCTURE
Nuclear Data Sheets for A=199, 3:45756
LEAD 203/ENERGY LEVELS
Nuclear data sheets for A=203, 3:45757
LEAD 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
LEAD 207 TARGET/NEUTRON REACTIONS
Observation of primary E2 transitions in the reaction $^{2}07Pb(n, y)$, 3:45754
LEAD 208/CHARGE DENSITY
Pion-exchange contributions to charge densities of closed-shell nuclei, 3:45691
LEAD 208/ENERGY-LEVEL TRANSITIONS
Observation of primary E2 transitions in the reaction $^{2}07Pb(n, y)$, 3:45754
LEAD 208/GIANT RESONANCE
Observation of primary E2 transitions in the reaction $^{2}07Pb(n, y)$, 3:45754
LEAD 208/HIGH SPIN STATES
Observation of 12^{-} magnetic spin states in $^{2}08Pb$, 3:45758
LEAD 208 TARGET/ALPHA REACTIONS
Extension of core polarization in inelastic scattering to include charge-exchange reactions, 3:45792
LEAD 208 TARGET/ELECTRON REACTIONS
Observation of 12^{-} magnetic spin states in $^{2}08Pb$, 3:45758
LEAD 208 TARGET/NEON 20 REACTIONS
$^{2}0Ne$ nuclear moments from $^{2}0Ne(131\ MeV) + {}^{2}08Pb$ scattering, 3:45712
LEAD 208 TARGET/PION MINUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
LEAD 208 TARGET/PION PLUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
LEAD 208 TARGET/PROTON REACTIONS
Analyzing power in proton-nucleus elastic scattering at 0.8 GeV, 3:45702
Extension of core polarization in inelastic scattering to include charge-exchange reactions, 3:45792
LEAD ALLOYS/CRITICAL CURRENT
Vortex pinning on grain boundaries in Pb-In alloys, 3:45049
LEAD ALLOYS/GRAIN BOUNDARIES
Vortex pinning on grain boundaries in Pb-In alloys, 3:45049
LEAD TELLURIDES/SPUTTERING
Thin film photovoltaic diodes and method for making same (Patent), 3:44379
LEAK DETECTORS/OPERATION
Acoustic leakage detection in pipelines, 3:44189 (ANL-Trans-1131)
LEED
See ELECTRON DIFFRACTION
LEPTON REACTIONS
See also ELECTRON REACTIONS
MUON REACTIONS
NEUTRINO REACTIONS
LEPTON REACTIONS/INELASTIC SCATTERING
Effects of parity nonconservation on the inelastic scattering of leptons by nuclei ($0^{+}\rightarrow0^{-}$ transition), 3:45806
LEPTON-LEPTON INTERACTIONS
See also ELECTRON-POSITRON INTERACTIONS
LEPTON-LEPTON INTERACTIONS/V-A THEORY
Possible existence of a weak V+A lepton-lepton interaction, 3:45623
LEPTON-NUCLEON INTERACTIONS
See also DEEP INELASTIC SCATTERING
MUON-NUCLEON INTERACTIONS
NEUTRINO-NUCLEON INTERACTIONS
LEPTON-NUCLEON INTERACTIONS/DEEP INELASTIC SCATTERING
Possible suppression of P-odd effects in heavy atoms, 3:45516
LEPTONS
See also ELECTRONS
HEAVY LEPTONS
MUONS
NEUTRINOS
LEPTONS/PAIR PRODUCTION
Testing quantum chromodynamics in the hadroproduction of real and virtural photons, 3:45669
LET
(Linear Energy Transfer.)
LET/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
LIGHT NUCLEI/ALPHA REACTIONS
Backward peaks of the cross section in nuclear reactions and exchange processes (> or = 15 MeV), 3:45804
LIGHT NUCLEI/LEPTON REACTIONS
Effects of parity nonconservation on the inelastic scattering of leptons by nuclei ($0^{+}\rightarrow0^{-}$ transition), 3:45806
LIGHT SOURCES/POLARIZATION
Description of a polarized source of He I radiation for surface studies, 3:45271
LIGHT WATER BREEDER REACTORS
See LWBR TYPE REACTORS
LIGHTING SYSTEMS/ENERGY CONSERVATION
Illumination also needs energy. Measures for rational and economical uses of illumination energy, 3:44950
LIGNITE/FLUIDIZED-BED COMBUSTION
Fluidized-bed combustion test of low-quality fuels: Texas lignite and lignite refuse, 3:44134 (MERC/RI-78/3)
LIMESTONE/EVALUATION
Supportive studies in fluidized-bed combustion. Quarterly report, July-September 1977, 3:44131 (ANL/CEN/FE-77-8)
LIMITERS/HYDRAULIC CONTROL DEVICES
Simulation of drive characteristics of JT-60 movable limiter, 3:46125 (JAERI-M-7130)
LINEAR ENERGY TRANSFER
See LET
LINEAR THETA PINCH DEVICES/INSTABILITY GROWTH RATES
Electromagnetic ion beam instability and energy loss of fast alpha particles, 3:46008
LINEAR THETA PINCH DEVICES/ION BEAMS
Radial ion energy measurements in a fast theta pinch, 3:45883
LINEAR THETA PINCH DEVICES/MAGNETIC MIRRORS
End loss reduction in linear devices by means of oscillating multiple mirrors, 3:45872 (IPPJ-285)
LINEAR THETA PINCH DEVICES/OSCILLATION MODES
Rotational instabilities in a theta pinch, 3:46000
LINEAR THETA PINCH DEVICES/PLASMA HEATING
Radial ion energy measurements in a fast theta pinch, 3:45883
LINEAR THETA PINCH DEVICES/PLASMA INSTABILITY
Rotational instabilities in a theta pinch, 3:46000
LINEAR THETA PINCH DEVICES/PLUGGING
End pluggings of a linear theta pinch by hot high z plasmas of high mass number, 3:45873 (N-77-33979)
LIQUEFIED NATURAL GAS/DENSITY
A comparison of mathematical models for the prediction of LNG (liquefied natural gas) densities, 3:44198 (PB-276047)
LIQUEFIED NATURAL GAS/HAZARDS
Liquid-natural-gas spill-effects program, 3:44195 (UCRL-50016-78-1)
LIQUID ASPHALT
See RESIDUAL FUELS
LIQUID CRYSTALS/PHASE TRANSFORMATIONS
High resolution ac calorimeter for organic liquids, 3:45252
LIQUID CRYSTALS/TOPOLOGY
Investigation of singularities in superfluid He^{3} in liquid crystals by the homotopic topology methods, 3:45555
LIQUID DROP MODEL/FUSION REACTIONS
Statistical-model analyses of heavy-ion-induced fusion reaction products, 3:45738
LIQUID METAL FAST BREEDER REACTORS
See LMFBR TYPE REACTORS
LIQUID METAL-WATER REACTIONS
See MOLTEN METAL-WATER REACTIONS

LIQUID PHASE METHANATION PROCESS/PILOT PLANTS
Liquid phase methanation pilot plant installation and operation. Quarterly report, October 1, 1976-December 31, 1976 (Portable), 3:44039 (FE-2036-21)
Liquid phase methanation pilot plant operation and laboratory support work. Quarterly report, October 1, 1977-December 31, 1977 (Portable), 3:44040 (FE-2036-24)
LIQUID WASTES
See also WASTE WATER
LIQUID WASTES/CHEMICAL ANALYSIS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
LIQUID WASTES/WASTE PROCESSING
Review of current interest and research in water hyacinth-based wastewater treatment. Final report, 3:44966 (N-77-33683)
LIQUID-METAL MHD GENERATORS/TWO-PHASE FLOW
Two-phase liquid-metal MHD generator experiments and pressure-gradient correlations, 3:44902 (CONF-780336-1)
LITHIUM/ATOM-ATOM COLLISIONS
Photon and positive ion production from collisions of superthermal hydrogen atoms with lithium atoms and molecules, 3:45523
LITHIUM/AUTOIONIZATION
Excitation of autoionization states of LiI in electron-atom collisions, 3:45539
LITHIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
LITHIUM 6 REACTIONS/COMPOUND-NUCLEUS REACTIONS
Alpha-cluster structure of the ^{20}Ne nucleus at excitation energies above 30 MeV, 3:45713
LITHIUM 6 TARGET/ELECTRON REACTIONS
Quasielastic scattering of electrons by ^{6}Li, ^{7}Li, and ^{9}Be and the final-state interaction, 3:45709
LITHIUM 6 TARGET/NEUTRON REACTIONS
Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
LITHIUM 6 TARGET/TRITON REACTIONS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
LITHIUM 7 TARGET/ELECTRON REACTIONS
Quasielastic scattering of electrons by ^{6}Li, ^{7}Li, and ^{9}Be and the final-state interaction, 3:45709
LITHIUM 7 TARGET/NEUTRON REACTIONS
Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
LITHIUM 7 TARGET/TRITON REACTIONS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
LITHIUM 8/ENERGY LEVELS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
LITHIUM 9/ENERGY LEVELS
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
LITHIUM HYDRIDES/EMISSION SPECTRA
Radiative transition probabilities for the B ^{1}Pi-X $^{1}\Sigma^{+}$ and B ^{1}Pi-A $^{1}\Sigma^{+}$ bands of ^{7}LiH, 3:45492
Radiative lifetimes for vibrational levels of the B ^{1}Pi state of ^{7}LiH, 3:45493
LITHIUM HYDRIDES/ENERGY-LEVEL TRANSITIONS
Radiative transition probabilities for the B ^{1}Pi-X $^{1}\Sigma^{+}$ and B ^{1}Pi-A $^{1}\Sigma^{+}$ bands of ^{7}LiH, 3:45492
Radiative lifetimes for vibrational levels of the B ^{1}Pi state of ^{7}LiH, 3:45493
LITHIUM IONS/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535
Nonstatistical propulation of magnetic substates of the $(1s^{-1}2p^{-1})$ $^{1}P_{1}$ state in Al, 3:45532
LITHIUM IONS/MICRODOSIMETRY
Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison, 3:45827 (BNL-24330)
LITHIUM NITRIDES/CHEMICAL PREPARATION
Solid electrolyte battery materials. Final report, 1 July 1976-31 September 1977, 3:44851 (AD-A-048330)
LITHIUM NITRIDES/CRYSTAL STRUCTURE
Solid electrolyte battery materials. Final report, 1 July 1976-31 September 1977, 3:44851 (AD-A-048330)
LITHIUM NITRIDES/IONIC CONDUCTIVITY
Solid electrolyte battery materials. Final report, 1 July 1976-31 September 1977, 3:44851 (AD-A-048330)
LIVER/METABOLISM
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
LIVER/MORPHOLOGICAL CHANGES
Ageing changes in the liver of two poeciliid fishes, the guppy Poecilia (Lebistes) reticulata and the Amazon molly, P. formosa, 3:45394
LIVESTOCK
See DOMESTIC ANIMALS
LMFBR TYPE REACTORS
See also BN-350 REACTOR
CLINCH RIVER BREEDER REACTOR
EBR-2 REACTOR
FFTF REACTOR
PEC BRASIMONE REACTOR
PHENIX REACTOR
LMFBR TYPE REACTORS/BREEDING BLANKETS
Radial blanket design and development quarterly progress report for period ending November 30, 1977, 3:44699 (WARD-RB-3045-22)
LMFBR TYPE REACTORS/CONTAINMENT SHELLS
Leakage effects on LMFBR cell liners, 3:44813 (SAND-78-0742C)
LMFBR TYPE REACTORS/CONTAINMENT SYSTEMS
Filtration of aerosols produced by a sodium fire, 3:44824
LMFBR TYPE REACTORS/FIRES
Filtration of aerosols produced by a sodium fire, 3:44824
LMFBR TYPE REACTORS/FUEL ASSEMBLIES
Localized duct wall cyclic thermal stresses in vented assembly LMFBR cores, 3:44692 (GEFR-00351)
LMFBR TYPE REACTORS/FUEL ELEMENT CLUSTERS
Collection and evaluation of salt mixing data with the real time data acquisition system, 3:44689 (COO-2245-36TR)
LMFBR TYPE REACTORS/FUEL-COOLANT INTERACTIONS
Fuel-Coolant Thermal Interaction Project. Progress report No. 8, 3:44799 (COO-2781-14)
LMFBR TYPE REACTORS/MELTDOWN
Growth of molten core debris pools in concrete. Progress report, March 1, 1977-November 30, 1977, 3:44800 (COO-4261-4)
LMFBR TYPE REACTORS/MOLTEN METAL-WATER REACTIONS
Interim evaluation of Sodium-Water Reaction Test No. 1 data and comparison with TRANSWRAP analyses: Series I large leak test program, 3:44691 (GEFR-00027(L))
LMFBR TYPE REACTORS/PIPES
Thermal ratchetting tests of Type 304 stainless steel pipe: specimens TTT-1 and TTT-2, 3:45013 (ORNL-5386)
LMFBR TYPE REACTORS/PRIMARY COOLANT CIRCUITS
Prediction of primary circuit contamination in power reactors, 3:44654
LMFBR TYPE REACTORS/REACTIVITY COEFFICIENTS
Comparisons of sodium void and Doppler reactivities in large oxide and carbide LMFBRs, 3:44687 (ANL-78-41)
LMFBR TYPE REACTORS/REACTOR COMPONENTS
Friction, wear, and corrosion of laves-hardened nickel alloy hardsurfacing in sodium, 3:44695 (HEDL-SA-1391)
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978, 3:44685 (AI-DOE-13231)
LMFBR TYPE REACTORS/REACTOR COOLING SYSTEMS
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978, 3:44685 (AI-DOE-13231)
Tritium permeation through oxidized 304 and 316 stainless steel, 3:44694 (HEDL-SA-1326)
LMFBR TYPE REACTORS/REACTOR CORE DISRUPTION
Effects of internal circulation velocity and noncondensable gas on vapor condensation from a rising bubble, 3:44821
LMFBR TYPE REACTORS/REACTOR CORES
Design and economics of large LMFBRs, 3:44693 (HEDL-SA-1321)
LMFBR TYPE REACTORS/SHIELDING
Development of a computer code for neutron streaming calculation in LMFBR (MADONNA code), 3:44703
Integral data for the prediction of neutron propagation in iron-sodium mixtures, 3:44705
Results of neutron propagation in steel sodium mixtures with various source spectra on Harmonie and Tapiro, 3:44704
Study of applicability of an albedo Monte Carlo method for neutron streaming calculation, 3:44702
Two-dimensional shielding benchmarks for sodium and iron at Yayoi, 3:44707
UK fast reactor shield design and performance, 3:44706
LMFBR TYPE REACTORS/SHROUDS
Computation of the weight function from a stress intensity factor, 3:44686 (ANL-77-82)
LMFBR TYPE REACTORS/STEAM GENERATORS
Interim evaluation of Sodium-Water Reaction Test No. 1 data and comparison with TRANSWRAP analyses: Series I large leak test program, 3:44691 (GEFR-00027(L))
LNG
See LIQUEFIED NATURAL GAS
LOADING MACHINES (REACTOR)
See REACTOR CHARGING MACHINES

LOFT REACTOR/BLOWDOWN
Comparison of experimental results with analytical predictions for LOFT nonnuclear tests with core simulator. Final report, 3:44803 (EPRI-NP-800)
LOFT REACTOR/PIPES
Fatigue life of LOFT Class I pipe welds, 3:44782 (LTR-11-20(Rev.B.))
LOFT REACTOR/PRESSURIZERS
LOFT pressurizer surge and spray line piping thermal analysis, Class I review, 3:44783 (LTR-1144-36)
LOGIC CIRCUITS/COMPUTER-AIDED DESIGN
LCL: a compiler and language for logical mask checking, 3:45229 (SAND-77-2031)
LONG TERM INTAKE
See CHRONIC INTAKE
LONGWALL MINING
See also COAL MINING
LONGWALL MINING/MACHINE TOOLS
Coordination of strip mining and completion of longwall working, 3:44101
LONGWALL MINING/MINE HAULAGE
Chainless haulage systems for power loaders. Information circular as of April 1978, 3:44094 (FE-SFMP-1(78))
LONGWALL MINING/MINING EQUIPMENT
Chainless haulage systems for power loaders. Information circular as of April 1978, 3:44094 (FE-SFMP-1(78))
Longwall mining, 3:44109
Underground coal mine instrumentation and test. Final report, 3:44095 (N-77-33479)
LONGWALL MINING/PERFORMANCE
Coordination of strip mining and completion of longwall working, 3:44101
LOSS OF COOLANT/FLUID FLOW
BWR pool dynamics in a loss of coolant accident. Calculation of the air-venting phase, 3:44818 (UCRL-52435)
LOSS OF COOLANT/HEAT TRANSFER
PWR FLECHT skewed profile low flooding rate test series evaluation report, 3:44819 (WCAP-9183)
LOSS OF COOLANT/HYDRAULICS
PWR FLECHT skewed profile low flooding rate test series evaluation report, 3:44819 (WCAP-9183)
LOSS OF COOLANT/PRESSURE SUPPRESSION
Small-scale modeling of vertical loads for the boiling-water-reactor pressure-suppression system, 3:44816 (UCRL-50016-78-1)
LOSS OF COOLANT/TWO-PHASE FLOW
Characteristics and stability analyses of transient one-dimensional two-phase flow equations and their finite difference approximations (PWR), 3:44820
LOSS OF FLUID TEST REACTOR
See LOFT REACTOR
LOW BTU GAS/COMBUSTION PRODUCTS
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1-December 30, 1977, 3:44615 (FE-1765-42)
LOW BTU GAS/DESULFURIZATION
Process for cleaning and removal of sulfur compounds from low Btu gases. Quarterly summary report, January-March 1978, 3:44031 (PNL-2040-9)
LOW-BETA PLASMA/ALFVEN WAVES
Collapse of Alfven waves, 3:46074
Nonlinear evolution of drift Alfven and double tearing instabilities, 3:46006
LOW-BETA PLASMA/DIFFUSION
Classical diffusion in large-aspect toroidal plasmas, 3:45881
LOW-BETA PLASMA/HELICAL INSTABILITY
Nonlinear evolution of drift Alfven and double tearing instabilities, 3:46006
LUBRICATING OILS/PRODUCTION
Process of hydrodesulfurization and separate solvent extraction of distillate and deasphalted residual lubricating oil fractions (Patent), 3:44171
LUNGS/MONITORING
Status of plutonium assessment in lung, 3:45403 (ORNL-tr-4619)
LUNGS/NEOPLASMS
Lung tumors in rats on chronic inhalation of thorium dioxide, 3:45404 (ORNL-tr-4544)
LUNGS/RADIATION DOSES
Status of plutonium assessment in lung, 3:45403 (ORNL-tr-4619)
LUNGS/RADIONUCLIDE KINETICS
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
LUTETIUM 175 TARGET/FLUORINE 19 REACTIONS
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from ^{1}94Hg compound nuclei, 3:45751
LWBR TYPE REACTORS/FUEL RODS
Detection of radioactive surface and weld contamination (ThO_2 and $^{233}UO_2$) on light water breeder reactor fuel rods using alpha ionization detectors (LWBR development program), 3:44697 (WAPD-TM-1130)
LWBR TYPE REACTORS/REACTOR MATERIALS
Method for measurement of relative differences in thermal expansion coefficients (LWBR development program), 3:44698 (WAPD-TM-1134)
LWGR TYPE REACTORS
See also N-REACTOR
LWGR TYPE REACTORS/REACTOR COOLING SYSTEMS
Radiation safety of nuclear power plants with large channel-type reactors, 3:44827
LWGR TYPE REACTORS/REACTOR SAFETY
Radiation safety of nuclear power plants with large channel-type reactors, 3:44827
LYMPHOCYTES/BIOCHEMICAL REACTION KINETICS
Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer, 3:45375 (UR-3490-1379)
LYMPHOID CELLS
See LYMPHOCYTES

M

MACHINE PARTS
See also SPRINGS
MACHINE PARTS/CASTING
No-bake systems in modern foundry technology, 3:44958 (IS-M-145)
MAGNESIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
MAGNESIUM/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
MAGNESIUM 24/ENERGY LEVELS
Population of resonant $^{12}C + {}^{12}C$ states via the reaction $^{12}C(^{16}O, \alpha)^{24}Mg$, 3:45699
Structure in the Radiative Capture of ^{1}2C by ^{1}2C near the coulomb barrier, 3:45701
MAGNESIUM 24/HIGH SPIN STATES
Confirmation of 8^{+} assignment to the 11.86 MeV level in ^{2}4Mg, 3:45706
MAGNESIUM 24/RANGE
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
MAGNESIUM 24/STOPPING POWER
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
MAGNESIUM 24 TARGET/OXYGEN 16 REACTIONS
Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
Resonant effects in the reaction ^{2}4Mg (^{1}6O,^{1}2C)^{2}8Si, 3:45716
MAGNESIUM 26 TARGET/OXYGEN 16 REACTIONS
Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
MAGNESIUM 26 TARGET/OXYGEN 18 REACTIONS
Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
MAGNESIUM ISOTOPES/PROTON REACTIONS
Isotopic dependence of the yield of ^{1}7N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
MAGNESIUM OXIDES/STRESS RELAXATION
Impurity effects on the creep of polycrystalline magnesium and aluminum oxides at elevated temperatures. Technical progress report, December 19, 1976-December 18, 1977, 3:45065 (COO-1591-32)
MAGNETIC BREMSSTRAHLUNG
See SYNCHROTRON RADIATION
MAGNETIC ENERGY STORAGE
See also SUPERCONDUCTING MAGNETS
MAGNETIC ENERGY STORAGE/DC TO DC CONVERTERS
User's manual: computer-aided design programs for inductor-energy-storage dc-to-dc electronic power converters, 3:44835 (N-77-33602)
MAGNETIC ENERGY STORAGE EQUIPMENT/DESIGN
Structural design for a 10-GWh SMES vacuum vessel, 3:44834 (LA-UR-77-2754)
MAGNETIC FIELD CONFIGURATIONS/PLASMA PRESSURE
Expression for β in linked min-B configurations, 3:45961

MAGNETIC MATERIALS/HEISENBERG MODEL
Critical dynamics of a Heisenberg spin-glass, 3:45834
MAGNETIC MIRROR CONFIGURATIONS/TRAPPED PROTONS
Computer simulation studies of strong proton rings, 3:45882
MAGNETIC MIRROR TYPE REACTORS/REVIEWS
Alternative approaches to plasma confinement, 3:46083 (N-77-34000)
MAGNETIC MIRRORS
See also MFTF DEVICES
2X DEVICES
MAGNETIC MIRRORS/BEAM INJECTION HEATING
Injection of electron beams into mirror confined plasmas (I), 3:45892 (UCRL-Trans-11356)
MAGNETIC MIRRORS/PLASMA CONFINEMENT
Ion losses from end-stoppered mirror trap, 3:45889
MAGNETIC MIRRORS/PLUGGING
Report on radio frequency plugging research (3rd report), 3:45888 (UCRL-Trans-11347)
MAGNETIC MONOPOLES/PARTICLE PRODUCTION
Search for magnetic monopoles at the CERN Intersecting Storage Rings, 3:45578
MAGNETIC SURFACES
See MAGNETIC FIELD CONFIGURATIONS
MAGNETIC SURVEYS/TECHNOLOGY ASSESSMENT
Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL-6815)
MAGNETOACOUSTIC WAVES/DISPERSION RELATIONS
Coupling to fast eigenmodes in a non-uniform plasma, 3:46046
MAGNETOACOUSTIC WAVES/REFRACTION
Effect of refraction on the propagation of magnetosonic waves in an inhomogeneous plasma, 3:46061
MAGNETOHYDRODYNAMIC CHANNELS
See MHD CHANNELS
MAGNETOHYDRODYNAMIC GENERATORS
See MHD GENERATORS
MAGNETOHYDRODYNAMIC WAVES
See HYDROMAGNETIC WAVES
MAGNETOHYDRODYNAMICS/SHOCK WAVES
Theoretical and experimental investigations on shock waves in gas-solid flows, 3:44903 (N-77-33468)
MAGNETOHYDRODYNAMICS/TWO-PHASE FLOW
Theoretical and experimental investigations on shock waves in gas-solid flows, 3:44903 (N-77-33468)
MAGNETOPAUSE/ELECTRIC FIELDS
Electric field topology near the dayside magnetopause, 3:45486 (N-77-33737)
MAGNETOPLASMA COMPRESSORS/IMPURITIES
Dynamics of a multicomponent plasma in a quasisteady coaxial accelerator with an azimuthal magnetic field, 3:45974
MAGNETOPLASMA COMPRESSORS/PLASMA ACCELERATION
Cathode potential drop in the channel of a magnetoplasma compressor, 3:45975
MAGNETOSPHERE/ELECTRON DENSITY
Energetic electrons at the synchronous altitude 1974-1977. Interim report (< 4 MeV), 3:45485 (AD-A-048432)
MAGNETOSPHERE/HYDROMAGNETIC WAVES
Interaction of fast electrons with hydromagnetic waves at a bounce resonance, 3:46022
MAGNETOSPHERE/INTERACTIONS
Interplanetary medium data book, 3:45473 (N-77-34065)
MAGNETOSPHERE/ION WAVE INSTABILITY
Current-driven instabilities in a laminar perpendicular shock, 3:45488
MAGNETOSPHERE/SOLAR WIND
Parameters of the solar wind responsible for plasma injection into the region of the magnetospheric ring current, 3:45463
MAGNETOSPHERE/TWO-STREAM INSTABILITY
Current-driven instabilities in a laminar perpendicular shock, 3:45488
MAGNETOTAIL/HOT PLASMA
Processes at the magnetotail baoundary: Comments on 'On hot tenuous plasmas, fireballs, and boundary layers in the earth's magnetotail' by L. A. Frank, K. L. Ackerson, and R. P. Lepping, 3:45487
MAGNETOTELLURIC SURVEYS/TECHNOLOGY ASSESSMENT
Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL-6815)
MAINE YANKEE REACTOR/ECCS
Potential common mode flooding of ECCS equipment rooms, 3:44715 (DOCKET-50309-855)
MAIZE/SOLAR DRYING
Solar grain drying, 3:44460
MANGANESE/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
MANGANESE 55 TARGET/OXYGEN 16 REACTIONS
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
MANGANESE 57/ENERGY-LEVEL TRANSITIONS
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
MANGANESE 57/HIGH SPIN STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
MANGANESE 57/YRAST STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
MANGANESE 58/ENERGY-LEVEL TRANSITIONS
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
MANGANESE 58/HIGH SPIN STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
MANGANESE 58/YRAST STATES
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
MANGANESE 60/BETA-MINUS DECAY
Mass and β decay of the new neutron-rich isotope ^{60}Mn, 3:45729
MANGANESE OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
MANGANESE OXIDES/ENVIRONMENTAL TRANSPORT
Role of hydrous metal oxides in the transport of heavy metals in the environment (Fe, Mn, Cu, Zn, Ni, Cd), 3:45345
MANGANESE OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
MANOMETERS
See PRESSURE GAGES
MANURES/ANAEROBIC DIGESTION
Dirt feedlot residue experiments. Quarterly progress report, October 1, 1977-November 30, 1977, 3:44386 (COO-2952-16)
Prospects of biogasproduction from agricultural organic residues, 3:44333
MANY-BODY PROBLEM
See also FOUR-BODY PROBLEM
THREE-BODY PROBLEM
MANY-BODY PROBLEM/FORM FACTORS
Change in the behavior of formfactors of compound systems as high transferred momenta are approached asymptotically, 3:45857
MARCOULE PHENIX REACTOR
See PHENIX REACTOR
MARGINAL-COST PRICING
Electric Utility Rate Design Study: how to quantify marginal costs, Topic 4 results for Tennessee Valley Authority, 3:44890 (NP-22554)
Electric Utility Rate Design Study: how to quantify marginal costs, a reply to Task Force 4 comments, 3:44891 (NP-22555)
MARGINAL-COST PRICING/RATE STRUCTURE
Electric Utility Rate Design Study: making the transition from unit marginal costs to rates. Results for Portland General Electric Company, 3:44892 (NP-22556)
MARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
MARITIME TRANSPORT
Marine approaches to U.S. ports: a flexible and obstruction-free system is needed (Shipping routes vs offshore exploration), 3:44883 (CED-78-107)
MARSHES
No. 2 fuel oil spill in Bourne, Massachusetts: immediate assessment of the effects of marine invertebrates and a 3-year study of growth and recovery of a salt marsh, 3:44182
MASKS
See RESPIRATORS
MASS TRANSFER
Minimum entropy production principle and Ostwald ripening, 3:45831 (COO-4385-1)
MASSACHUSETTS/COASTAL REGIONS
Massachusetts coastal zone management program. Volume I, 3:45325 (PB-274031)
MASSACHUSETTS/COASTAL WATERS
Massachusetts coastal zone management program. Volume I, 3:45325 (PB-274031)

MATERIALS (FERROELECTRIC)
See FERROELECTRIC MATERIALS
MATERIALS TESTING REACTORS
Handbook of materials testing reactors and ancillary hot laboratories in the European Community, 3:44790 (EUR-5369)
MATSUKAWA GEOTHERMAL FIELD/GEOTHERMAL POWER PLANTS
Safety measures for geothermal power generation plant without steady monitoring system, 3:44598 (NP-22300)
MEAT INDUSTRY/ENERGY CONSERVATION
Study of energy conservation potential in the meat packing industry, 3:44954 (FEA/D-76/291)
MEDICINE
See also BIOMEDICAL RADIOGRAPHY
NUCLEAR MEDICINE
OPHTHALMOLOGY
PATIENTS
RADIOTHERAPY
MEDICINE/BIBLIOGRAPHIES
Medical information systems (a bibliography with abstracts). Report for February 1964-December 1977, 3:45385 (NTIS/PS-78/0031)
MEDICINE/INFORMATION SYSTEMS
Medical information systems (a bibliography with abstracts). Report for February 1964-December 1977, 3:45385 (NTIS/PS-78/0031)
MEDICINES
See DRUGS
MELTDOWN/HEAT TRANSFER
Growth of molten core debris pools in concrete. Progress report, March 1, 1977-November 30, 1977 (LMFBR), 3:44800 (COO-4261-4)
MELTDOWN/RESEARCH PROGRAMS
Light water reactor safety research program. Quarterly report, July-September 1977 (Corium-concrete interactions; vapor explosions), 3:44810 (SAND-78-0076)
MERCURY/BIODEGRADATION
Biological and nonbiological transformations of mercury in aquatic systems, 3:45347
MERCURY/BIOLOGICAL ACCUMULATION
Accumulation and excretion of heavy metals in organisms (/sup 115m/Cd, ^{203}Hg, Pb), 3:45378
MERCURY/BIOLOGICAL EFFECTS
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
Methylmercury analysis (a review and some data) (Minamata disease in Japan), 3:45341
MERCURY/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3.44590
Review of the status of total mercury analysis, 3:45107
MERCURY/CHEMICAL REACTIONS
Methylmercury analysis (a review and some data) (Minamata disease in Japan), 3:45341
Use of synthetic scavengers for the binding of heavy metals (Mercury), 3:45355
MERCURY/DISTRIBUTION
Mercury distribution in the Chesapeake Bay, 3:45350
MERCURY/ECOLOGICAL CONCENTRATION
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
Feasibility of restoring mercury-contaminated waters, 3:45353
Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
MERCURY/ENVIRONMENTAL EFFECTS
Canadian experience with the reduction of mercury at chlor-alkali plants, 3:45313
Distribution of mercury in fish and its form of occurrence, 3:45348
Feasibility of restoring mercury-contaminated waters, 3:45353
Use of synthetic scavengers for the binding of heavy metals (Mercury), 3:45355
MERCURY/MAXIMUM PERMISSIBLE CONCENTRATION
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
MERCURY/SORPTION
Sorption phenomenon in the organics of bottom sediments (Mercury, sulfur), 3:45344
MERCURY/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
MERCURY 199/ENERGY LEVELS
Nuclear Data Sheets for A=199, 3:45756
MERCURY 199/NUCLEAR STRUCTURE
Nuclear Data Sheets for A=199, 3:45756
MERCURY 203/ENERGY LEVELS
Nuclear data sheets for A=203, 3:45757
MERCURY 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
MERCURY FLUORIDES/ORDER-DISORDER TRANSFORMATIONS
One-dimensional fluctuations and the chain-ordering transformation in Hg/sub 3-delta/AsF$_6$, 3:45081
MERCURY PLANET/MAGNETIC FIELDS
Report of the terrestrial bodies science working group. Volume 2. Mercury, 3:45476 (N-77-34075)
MERCURY TELLURIDES/ELECTRONIC STRUCTURE
Conduction-electron spin resonance in Hg/sub 1-x/Cd/sub x/Te solid solutions, 3:45097
MESON-MESON INTERACTIONS
See also PION-PION INTERACTIONS
MESON-MESON INTERACTIONS/SCATTERING AMPLITUDES
Resonance-particle interaction amplitudes for arbitrary spins, 3:45633
MESON-MESON INTERACTIONS/UNITARITY
Resonance-particle interaction amplitudes for arbitrary spins, 3:45633
MESONS/COMPOSITE MODELS
Composite model of mesons in relativistic configuration space, 3:45674
MESONS/CONFINEMENT
Effect of a weak field asymmetry on stability in an adiabatic magnetic confinement system, 3:45275
MESONS/PARTICLE PRODUCTION
Contribution of inelastic rescattering to cumulative meson production, 3:45644
Determination of the sea-quark distributions in the proton by single-particle inclusive reactions, 3:45604
MESSENGER-RNA/BIOCHEMICAL REACTION KINETICS
Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer, 3:45375 (UR-3490-1379)
METABOLISM/MATHEMATICAL MODELS
Accumulation and excretion of heavy metals in organisms (/sup 115m/Cd, ^{203}Hg, Pb), 3:45378
METAGALAXY
See UNIVERSE
METAL INDUSTRY/CO-GENERATION
Cogeneration of steam and electric power (Book; 4 parts), 3:44870
METAL INDUSTRY/ENVIRONMENTAL IMPACTS
Appalachian mineral resource development: environmental factors. Executive summary, 3:45363 (PB-274107)
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
METAL INDUSTRY/HAZARDOUS MATERIALS
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume II. Primary and secondary nonferrous smelting and refining. Final report, May 1974-April 1977, 3:45301 (PB-276170)
METAL INDUSTRY/POLLUTION CONTROL
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume III. ferrous smelting and refining. Final report, May 1974-April 1977, 3:45364 (PB-276171)
METAL INDUSTRY/WASTE HEAT UTILIZATION
Energy utilization in steel production - present status and future possibilities, 3:44961
Waste energy utilization in a rolling mill and in the subsequent treatment, 3:44960
METALS
See also ACTINIDES
ALKALI METALS
RARE EARTHS
METALS/BIOLOGICAL ACCUMULATION
Accumulation and excretion of heavy metals in organisms (/sup 115m/Cd, ^{203}Hg, Pb), 3:45378
METALS/BIOLOGICAL EFFECTS
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
Risk-benefit analysis and the economics of heavy metals control, 3:45357

METALS/CHEMICAL ANALYSIS
Analytical techniques for heavy metals other than mercury, 3:45342
METALS/CHEMICAL REACTIONS
Use of synthetic scavengers for the binding of heavy metals (Mercury), 3:45355
METALS/COSMOCHEMISTRY
Distribution of metals among the galactic populations and the evolution of the Galaxy, 3:45466
METALS/COST BENEFIT ANALYSIS
Risk-benefit analysis and the economics of heavy metals control, 3:45357
METALS/DISTRIBUTION
Field observations on the transport of heavy metals in sediments, 3:45343
METALS/ECOLOGICAL CONCENTRATION
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
METALS/ECONOMICS
Risk-benefit analysis and the economics of heavy metals control, 3:45357
METALS/ENVIRONMENTAL EFFECTS
Distribution of mercury in fish and its form of occurrence, 3:45348
Risk-benefit analysis and the economics of heavy metals control, 3:45357
Use of synthetic scavengers for the binding of heavy metals (Mercury), 3:45355
METALS/ENVIRONMENTAL TRANSPORT
Distribution of mercury in fish and its form of occurrence, 3:45348
Field observations on the transport of heavy metals in sediments, 3:45343
Heavy metals in the aquatic environment, 3:45338
METALS/EXCRETION
Accumulation and excretion of heavy metals in organisms (/sup 115m/Cd, ^{203}Hg, Pb), 3:45378
METALS/MAXIMUM PERMISSIBLE CONCENTRATION
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
METALS/PHYSICAL RADIATION EFFECTS
Study of radiation damage in metals by positron annihilation, 3:45059
METALS/REMOVAL
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
Physical-chemical methods of heavy metals removal (Water pollution), 3:45351
METALS/SURFACE CLEANING
Advances in cleaning metal and glass surfaces to micron-level cleanliness, 3:45182
Control of volatile organic emissions from solvent metal cleaning, 3:45322 (PB-274557)
METHANATION/CATALYSTS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977, 3:44048 (FE-2729-1)
METHANE/AUGER EFFECT
Anomalous spectral and yield features of Auger emission from symmetric molecules, 3:45510
METHANE/BIBLIOGRAPHIES
Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970-1977, 3:44328 (NTIS/PS-78/0054)
METHANE/BIOSYNTHESIS
Dirt feedlot residue experiments. Quarterly progress report, October 1, 1977-November 30, 1977, 3:44386 (COO-2952-16)
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
High quality methane gas through modified anaerobic digestion (Patent; at 2 to 5 atm and incorporation of pressurized recirculation), 3:44337
Prospects of biogasproduction from agricultural organic residues, 3:44333
Technology of putrefraction of organic material for production of methane, 3:44334
METHANE/COMBUSTION
Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970-1977, 3:44328 (NTIS/PS-78/0054)
METHANE/CONTROL
Use of polymer solution for consolidation of coal seams, 3:44140
METHANE/CORROSIVE EFFECTS
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
METHANE/MONITORING
Working the Threequarter seam at Markham colliery, with particular reference to the conveyor-mounted trepanner, 3:44104
METHANE/PRODUCTION
Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970-1977, 3:44328 (NTIS/PS-78/0054)
METHANE/SYNTHESIS
Thermochemical process for producing methane and oxygen (Patent), 3:44331
METHANE/TRACER TECHNIQUES
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP-1469)
METHANOL/BY-PRODUCTS
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977-October 28, 1977, 3:44044 (FE-2416-20)
METHANOL/SYNTHESIS
Conceptual designs of commercial plants: coal to methanol and methanol to gasoline. Quarterly technical progress report, August 1, 1977-October 28, 1977, 3:44044 (FE-2416-20)
METHANOL/THERMOCHEMICAL PROCESSES
Thermochemical process for producing methane and oxygen (Patent), 3:44331
METHYL ETHER/THERMOCHEMICAL PROCESSES
Thermochemical process for producing methane and oxygen (Patent), 3:44331
METHYLMERCURY/BIOLOGICAL EFFECTS
Methylmercury analysis (a review and some data) (Minamata disease in Japan), 3:45341
Review of dose-response relationships resulting from human exposure to methylmercury compounds, 3:45423
METHYLMERCURY/ECOLOGICAL CONCENTRATION
Feasibility of restoring mercury-contaminated waters, 3:45353
Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
Review of dose-response relationships resulting from human exposure to methylmercury compounds, 3:45423
METHYLMERCURY/ENVIRONMENTAL EFFECTS
Feasibility of restoring mercury-contaminated waters, 3:45353
METHYLMERCURY/SORPTION
Sorption phenomenon in the organics of bottom sediments (Mercury, sulfur), 3:45344
METHYLMERCURY/TOXICITY
Mercury concentrations in humans and consumption of fish containing methylmercury, 3:45340
MFTF DEVICES/QUALITY ASSURANCE
Evaluation and recommendations on U.C. Lawrence Livermore Labortory Quality Assurance Program, 3:46086 (UCRL-13834)
MHD CHANNELS/ELECTRIC ARCS
Interelectrode arcs and electrical fluctuations in an MHD channel, 3:44901 (CONF-770402-3)
MHD GENERATORS
See also CLOSED-CYCLE MHD GENERATORS
COAL-FIRED MHD GENERATORS
LIQUID-METAL MHD GENERATORS
MHD GENERATORS/DUCTS
Nucleation and evolution of slag droplets in coal combustion, 3:44132 (CONF-780307-8)
MHD GENERATORS/REVIEWS
Physics of MHD generators, 3:44899
MHD GENERATORS/SLAGS
Nucleation and evolution of slag droplets in coal combustion, 3:44132 (CONF-780307-8)
MHD POWER PLANTS/INTERNATIONAL COOPERATION
International cooperation in MHD power generation, 3:44894
MHD POWER PLANTS/TECHNOLOGY TRANSFER
International cooperation in MHD power generation, 3:44894
MICELLAR-POLYMER FLOODING
See MICROEMULSION FLOODING
MICROEMULSION FLOODING/RESEARCH PROGRAMS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
MICROSPHERES/FABRICATION
Cryogenic microshell pellets and other advanced targets for laser fusion, 3:44318
Tritium handling and the preparation of DT-containing micro-targets for laser fusion experiments, 3:44319
MICROWAVE DISCHARGES
See HIGH-FREQUENCY DISCHARGES
MILK/RADIOACTIVITY
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
MILL TAILINGS/STABILIZATION
Laboratory research on tailings stabilization methods and their effectiveness in radiation containment (Uranium, reduction of radon exhalation), 3:45314 (GJT-21)
MILLSTONE-1 REACTOR/REACTOR COOLING SYSTEMS
Reevaluation of feedwater nozzle cladding defects, Millstone Unit 1, 3:44642 (IAEA-18; CONF-751268-)

MINERAL OILS/DESULFURIZATION
Method to desulphurize heavy mineral oils (Patent), 3:44170
MINERAL WASTES/FLUIDIZED-BED COMBUSTION
Fluidized-bed combustion test of low-quality fuels: Texas lignite and lignite refuse, 3:44134 (MERC/RI-78/3)
MINERALS
See also BENTONITE
FERRITE GARNETS
URANIUM MINERALS
ZEOLITES
MINERALS/REMOVAL
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
MINERALS/WATER SATURATION
Rod-shaped probe for soaking minerals to be mined, especially coal in mining (Patent), 3:44119
MINERS/RADIATION PROTECTION
Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964-1977, 3:44253 (NTIS/PS-78/0048)
MINES
See also COAL MINES
URANIUM MINES
MINES/ENVIRONMENTAL EFFECTS
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
MINES/MINING EQUIPMENT
Optimal choice and conditions for the use of tires in mines, quarries, public works, and civil engineering, 3:44112
MINES/ROCK MECHANICS
Energy changes due to mining, 3:44117
MINING
See also COAL MINING
SURFACE MINING
UNDERGROUND MINING
MINING/PROCESS CONTROL
Review of nuclear techniques for process control in the gold and uranium mining industries, 3:44255
MINING EQUIPMENT
See also CONVEYORS
CUTTER LOADERS
MINING EQUIPMENT/ACCIDENTS
Chainless haulage systems for power loaders. Information circular as of April 1978, 3:44094 (FE-SFMP-1(78))
MINING EQUIPMENT/COMPARATIVE EVALUATIONS
Chainless haulage systems for power loaders. Information circular as of April 1978, 3:44094 (FE-SFMP-1(78))
MINING EQUIPMENT/EFFICIENCY
Efficiency of coalface equipment, 3:44106
MINING EQUIPMENT/MANUFACTURING
French mining equipment industry, 3:44118
MINING EQUIPMENT/PERFORMANCE TESTING
Underground coal mine instrumentation and test. Final report, 3:44095 (N-77-33479)
MINING EQUIPMENT/TIRES
Optimal choice and conditions for the use of tires in mines, quarries, public works, and civil engineering, 3:44112
Use of pneumatics by Houilleres de Provence, 3:44111
MINING EQUIPMENT/TRADE
French mining equipment industry, 3:44118
MINING EQUIPMENT/VENTILATION
Working the Threequarter seam at Markham colliery, with particular reference to the conveyor-mounted trepanner, 3:44104
MINING LAWS/COMPLIANCE
Digest of mining claim laws (Western states plus Alaska), 3:44864
MINING LAWS/EVALUATION
Digest of mining claim laws (Western states plus Alaska), 3:44864
MINNESOTA/ENERGY CONSERVATION
Energy emergency conservation and allocation plan, 3:44872 (PB-274492)
MINNESOTA/ENERGY MANAGEMENT
Energy emergency conservation and allocation plan, 3:44872 (PB-274492)
MIRROR FUSION TEST FACILITY
See MFTF DEVICES
MIRRORS (MAGNETIC)
See MAGNETIC MIRRORS
MIUS
(Modular Integrated Utility Systems.)
MIUS/DESIGN
Preliminary design study of a baseline MIUS, 3:44939 (N-77-34050)
MIXERS/OPERATION
Use of the dryer drum. Preprint 2843, 3:44957 (CONF-770448-2)
MODELS (COSMOLOGICAL)
See COSMOLOGICAL MODELS
MODELS (OPTICAL)
See OPTICAL MODELS
MODELS (SHELL)
See SHELL MODELS
MODELS (STATISTICAL)
See STATISTICAL MODELS
MODIFIED IN-SITU PROCESSES/ENVIRONMENTAL EFFECTS
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976-October 31, 1977. Volume I, 3:44204 (TID-28053/1)
MODIFIED IN-SITU PROCESSES/ENVIRONMENTAL IMPACTS
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976-October 31, 1977. Volume II, 3:44205 (TID-28053/2)
MOISTURE
See also WATER
MOISTURE/REMOVAL
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
MOLDS (CASTING)
See CASTING MOLDS
MOLECULAR BEAMS/ABSORPTION SPECTROSCOPY
Infrared spectroscopy in supersonic molecular beams: ν_3 band of SF_6 at 10.6 μm, 3:45503
MOLECULAR FLUORESCENCE SPECTROSCOPY
See FLUORESCENCE SPECTROSCOPY
MOLECULAR IONS/ABSORPTION SPECTRA
Theoretical absorption spectra of ArKr, 3:45545
MOLECULAR ORBITAL MODEL
See MOLECULES
MOLECULE-MOLECULE COLLISIONS/ELECTRONIC STRUCTURE
Resonance effects in the semiclassical theory of electronically nonadiabatic collision processes, 3:45528
MOLECULES
See also MUONIC MOLECULES
POLYATOMIC MOLECULES
MOLECULES/DIELECTRIC PROPERTIES
Existence of the dielectric constant in fluids of nonlinear rigid polar molecules, 3:45495
MOLECULES/ELECTRONIC STRUCTURE
GAUSSIAN 76: an ab initio molecular orbital program, 3:45544 (BNL-24136)
MOLECULES/EXCITATION
Effects of magnetic sublevel degeneracy on Rabi oscillations, 3:45547
MOLLUSCS
See also OYSTERS
Absence of aryl hydrocarbon hydroxylase (AHH) in three marine bivalves, 3:45376
MOLLUSCS/RESPIRATION
Effects of uptake and discharge of petroleum hydrocarbons on the respiration of the soft-shell clam, Mya arenaria, 3:45412
MOLTEN METAL-WATER REACTIONS
Light water reactor safety research program. Quarterly report, July-September 1977 (Corium-concrete interactions; vapor explosions), 3:44810 (SAND-78-0076)
MOLTEN SALTS/CATALYTIC EFFECTS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
MOLTEN SALTS/CORROSIVE EFFECTS
Process for cleaning and removal of sulfur compounds from low Btu gases. Quarterly summary report, January-March 1978, 3:44031 (PNL-2040-9)
MOLYBDENUM/BIOLOGICAL EFFECTS
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
MOLYBDENUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
MOLYBDENUM/CHEMISORPTION
Effect of primary ion energy and surface chemistry on the secondary ion yields in low-energy SIMS experiments, 3:45030
MOLYBDENUM/DENSITY
Specific volume measurements of Cu, Mo, Pd, and Ag and calibration of the ruby R_1 fluorescence pressure gauge from 0.06 to 1 Mbar, 3:45270
MOLYBDENUM/ENVIRONMENTAL TRANSPORT
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
MOLYBDENUM/GASEOUS DIFFUSION
Mechanism of lithium diffusion in single-crystal molybdenum, 3:45034

MOLYBDENUM/OXIDATION
Oxidation of the (110) face of a molybdenum single crystal, 3:45032
MOLYBDENUM/PHYSICAL RADIATION EFFECTS
Excited state formed by B^+ impact on metallic Cu and Mo, 3:45058
Surface damage of molybdenum and TZM alloy under D^+ impact, 3:45060
MOLYBDENUM/TOXICITY
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
MOLYBDENUM/WORK FUNCTIONS
Oxidation of the (110) face of a molybdenum single crystal, 3:45032
MOLYBDENUM 99/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
MOLYBDENUM ALLOYS
See also STAINLESS STEEL-316
MOLYBDENUM ALLOYS/AGE HARDENING
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
MOLYBDENUM ALLOYS/MICROSTRUCTURE
Some observations on the structure of Ti-11.5Mo-6Zr-4.5Sn (beta III) as affected by processing history. Technical report, 3:45007 (AD-A-048772)
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
MOLYBDENUM CARBIDES/SPUTTERING
X-ray photoelectron spectroscopy study of radiofrequency-sputtered titanium carbide, molybdenum carbide, and titanium boride coatings and their friction properties, 3:45066 (N-77-33348)
MOLYBDENUM COMPOUNDS/CATALYTIC EFFECTS
Process for improved carbon-supported hydrodesulfurization catalysts (Patent), 3:44159
MOLYBDENUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
MOLYBDENUM ORES/MILLING
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
MOLYBDENUM ORES/MINING
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
MOLYBDENUM OXIDES/CATALYTIC EFFECTS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
MOLYBDENUM OXIDES/CRYSTAL STRUCTURE
Electronic properties of transition metal dioxides, 3:45073
MOLYBDENUM OXIDES/ELECTRONIC STRUCTURE
Electronic properties of transition metal dioxides, 3:45073
MOLYBDENUM OXIDES/FERMI LEVEL
Electronic properties of transition metal dioxides, 3:45073
MONITORS (REACTOR)
See REACTOR CONTROL SYSTEMS
MONTANA/NATURAL GAS WELLS
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
MORPHOLOGICAL CHANGES/AGE DEPENDENCE
Ageing changes in the liver of two poeciliid fishes, the guppy Poecilia (Lebistes) reticulata and the Amazon molly, P. formosa, 3:45394
MORPHOLOGY
See MORPHOLOGICAL CHANGES
MOSFET/RADIATION HARDENING
Radiation hardened field effect device (Patent), 3:45267
MOUND LABORATORY/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
MULTI-ELEMENT ANALYSIS/EMISSION SPECTROSCOPY
Specifications for an inductively coupled plasma simultaneous multielement analysis system, 3:45112 (IS-4353)
MULTIPERIPHERAL MODEL/REGGE CUTS
Adler zero and the dual multiperipheral model, 3:45631
MULTIWIRE PROPORTIONAL CHAMBERS/DESIGN
Two detector MWPC position camera with honeycomb lead converters for medical imaging: performance and developments, 3:45254 (LBL-7205)
MULTIWIRE PROPORTIONAL CHAMBERS/PERFORMANCE
Two detector MWPC position camera with honeycomb lead converters for medical imaging: performance and developments, 3:45254 (LBL-7205)
MUNICIPAL WASTES/WASTE PROCESSING
Review of current interest and research in water hyacinth-based wastewater treatment. Final report, 3:44966 (N-77-33683)
MUON PAIRS/PAIR PRODUCTION
Origin of muon-induced dimuons and scale violation at small x, 3:45615
MUON REACTIONS/CAPTURE
Effect of a laser field on the probability for muon capture in light nuclei, 3:45519
MUONIC ATOMS/HYPERFINE STRUCTURE
Effect of a laser field on the probability for muon capture in light nuclei, 3:45519
MUONIC ATOMS/X-RAY SPECTRA
Nuclear charge distributions deduced from the muonic atoms of $^{2}32Th$, $^{2}35U$, $^{2}38U$, and $^{2}39Pu$, 3:45766
MUONIC MOLECULES/BINDING ENERGY
Schroedinger perturbation theory in the adiabatic representation of the three-body problem, 3:45521
MUON-NEUTRON INTERACTIONS/INELASTIC SCATTERING
Inelastic muon-neutron scattering: Charged-hadron multiplicities and prong cross sections, 3:45564
MUON-NUCLEON INTERACTIONS
See also MUON-NEUTRON INTERACTIONS
MUON-NUCLEON INTERACTIONS/DEEP INELASTIC SCATTERING
Origin of muon-induced dimuons and scale violation at small x, 3:45615
MUON-NUCLEON INTERACTIONS/PARTICLE PRODUCTION
Structure functions and charge ratios in muon-nucleon scattering, 3:45611
MUON-NUCLEON INTERACTIONS/SCALING LAWS
Origin of muon-induced dimuons and scale violation at small x, 3:45615
MUONS/MULTIPLE PRODUCTION
Electromagnetic backgrounds in neutrino-produced trimuon events, 3:45599
Origins of neutrino events with three muons, 3:45617
MUSSELS
See MOLLUSCS
MUTAGENS
Radiological protection. First European symposium on rad-equivalence, 3:45400
MUTSU REACTOR/SHIELDING
Mock-up experiment of radiation streaming through coolant pipe penetration, 3:44792
MX DEVICES
See MFTF DEVICES
MYOCARDIUM/BLOOD FLOW
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389

N

NAPHTHA/ALLOCATIONS
Draft environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company, 3:44329 (DES-77-1)
Final environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company, 3:44330 (FES-77-1)
NAPHTHALENE/ABSORPTION SPECTRA
Optical study of the temperature dependent scattering of the a exciton (polariton) of naphthalene, 3:45000
NATIONAL ENVIRONMENTAL POLICY ACT/EVALUATION
National Environmental Policy Act, 3:45321 (NP-23191)
NATIONAL ENVIRONMENTAL POLICY ACT/LEGAL ASPECTS
National Environmental Policy Act, 3:45321 (NP-23191)
NATURAL GAS
See also LIQUEFIED NATURAL GAS
NATURAL GAS/CHARGES
Problems of price determination for gas due to connections between the international markets of natural gas supply and demand in the Federal Republic of Germany. DIW study on changes proposed by the Monopoly Commission, 3:44887
NATURAL GAS/ECONOMIC POLICY
Problems of price determination for gas due to connections between the international markets of natural gas supply and demand in the Federal Republic of Germany. DIW study on changes proposed by the Monopoly Commission, 3:44887
NATURAL GAS/ENHANCED RECOVERY
Western gas sands project. Status report, 3:44196 (NVO-0655-105)

NATURAL GAS/ISOTOPE RATIO
Natural gases in the south German Molasse Basin. Application of D/H and $^{13}C/^{12}C$ isotope analyses to deduce their origin, 3:44194
NATURAL GAS/ORIGIN
Natural gases in the south German Molasse Basin. Application of D/H and $^{13}C/^{12}C$ isotope analyses to deduce their origin, 3:44194
NATURAL GAS/PRODUCTION
Oil and Gas Compact Bulletin. Volume 36, Number 1, July 1977, 3:44150 (CONF-770757-)
NATURAL GAS/TRANSPORT
Experience gained with the regulation on HP gas pipelines, issued on December 17, 1974 (German Federal Republic), 3:44197
NATURAL GAS DEPOSITS/EXPLORATION
Marine approaches to U.S. ports: a flexible and obstruction-free system is needed (Shipping routes vs offshore exploration), 3:44883 (CED-78-107)
NATURAL GAS DEPOSITS/MICROSTRUCTURE
Microcracks and matrix deformation in stressed gas-bearing sandstones, 3:44193 (UCRL-80328)
NATURAL GAS DEPOSITS/SIMULATION
Gassim. user's description: a gas reservoir simulation model, 3:44192 (N-77-33467)
NATURAL GAS INDUSTRY/ACCIDENTS
Report of the inquiry into serious gas explosions (Monograph), 3:44888
NATURAL GAS INDUSTRY/PRODUCTION
Oil industry in Austria during 1976, 3:44174
NATURAL GAS INDUSTRY/SAFEGUARDS
Report of the inquiry into serious gas explosions (Monograph), 3:44888
NATURAL GAS WELLS
See also PROPPING AGENTS
NATURAL GAS WELLS/ENVIRONMENTAL IMPACTS
Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED-78-93)
NATURAL GAS WELLS/EXPLOSIVE STIMULATION
Rio Blanco radiation contamination clearance report, 3:45285 (PNE-RB-79)
NATURAL GAS WELLS/HYDRAULIC FRACTURING
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
NATURAL GAS WELLS/OFFSHORE OPERATIONS
Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED-78-93)
NATURAL GAS WELLS/WATERFLOODING
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
NATURAL GAS WELLS/WELL DRILLING
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
NEODYMIUM LASERS/LASER MATERIALS
Manufacturing methods and technology engineering for neodymium-doped YAG laser rods. Quarterly progress report No. 2, 1 June-31 August 1977, 3:45160 (AD-A-048662)
NEODYMIUM LASERS/LINE BROADENING
Mode pulling in a neodymium garnet laser, 3:45195
NEODYMIUM LASERS/POLARIZATION
Durable interference polarizers for lasers, 3:45202
NEODYMIUM LASERS/Q-SWITCHING
Acousto-optic Q switches for YAG:Nd lasers, 3:45191
NEODYMIUM LASERS/RESEARCH PROGRAMS
Energetic, report No. 1, 3:45183 (UCRL-Trans-11348)
Energetic, report No. 3, 3:45184 (UCRL-Trans-11349)
Energetic, report No. 2, 3:45185 (UCRL-Trans-11351)
Fusion laser development at the Lawrence Livermore Laboratory, 3:46123
NEODYMIUM LASERS/SPECIFICATIONS
Powerful 12-channel laser installation "DELFIN" for spherical heating of thermonuclear targets, 3:46124
NEODYMIUM LASERS/TRAVELLING WAVES
Single-frequency operation of a pulsed neodynmium-glass ring laser, 3:45205
NEON/ATOM-ATOM COLLISIONS
Theory of inelastic collisions between low-lying excited- and ground-state Ne atoms, 3:45536
NEON/ION DRIFT
Mobilities and longitudinal diffusion coefficients for Cs^+ ions in He and Ne gas, 3:45093
NEON/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
NEON 16/MASS DEFECT
Pion double-charge exchange on ^{16}O and ^{18}O, 3:45697
NEON 20/CLUSTER MODEL
Alpha-cluster structure of the ^{20}Ne nucleus at excitation energies above 30 MeV, 3:45713
NEON 20/QUADRUPOLE MOMENTS
^{20}Ne nuclear moments from $^{20}Ne(131\ MeV) + {}^{208}Pb$ scattering, 3:45712
NEON 20/RANGE
Ranges of projectiles with $8 < or = Z < or = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
NEON 20/STOPPING POWER
Ranges of projectiles with $8 < or = Z < or = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
NEON 20 REACTIONS/COMPOUND-NUCLEUS REACTIONS
Relativistic two-fluid model of nucleus-nucleus collisions, 3:45762
NEON 20 REACTIONS/ELASTIC SCATTERING
^{20}Ne nuclear moments from $^{20}Ne(131\ MeV) + {}^{208}Pb$ scattering, 3:45712
NEON 20 REACTIONS/INELASTIC SCATTERING
^{20}Ne nuclear moments from $^{20}Ne(131\ MeV) + {}^{208}Pb$ scattering, 3:45712
NEON FLUORIDES/ELECTRONIC STRUCTURE
Covalent and ionic states of the rare gas monofluorides, 3:45174
NEOPENTANE
See 2-2-DIMETHYLPROPANE
NEOPLASMS/BIOLOGICAL RADIATION EFFECTS
Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr-77-73B)
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (X and gamma radiation, electrons, negative pions), 3:45398 (STI/PUB-441(Vol.1))
NEOPLASMS/CONTROL
Carcinogens in the environment, 3:45421 (NP-23191)
NEOPLASMS/DIAGNOSTIC TECHNIQUES
Computerized emission transaxial tomography and determination of local brain function, 3:45392
Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer-assisted CNS studies, 3:45393
Noninvasive brain imaging: computed tomography and radionuclides (Book), 3:45384
NEOPLASMS/RADIOINDUCTION
Lung tumors in rats on chronic inhalation of thorium dioxide, 3:45404 (ORNL-tr-4544)
NEOPLASMS/RADIOTHERAPY
Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr-77-73B)
NEPA
See NATIONAL ENVIRONMENTAL POLICY ACT
NEPTUNIUM FLUORIDES/ELECTRONIC STRUCTURE
Calculations of the electronic structure and transitions of actinide metal hexafluorides, 3:45507
NERVE CELLS/CELL DIFFERENTIATION
Hormonal effects on differentiation in neutral cultures (Rats), 3:45371 (UCLA-12-1144)
NERVOUS SYSTEM DISEASES/DIAGNOSTIC TECHNIQUES
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
Computerized emission transaxial tomography and determination of local brain function, 3:45392
Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer-assisted CNS studies, 3:45393
Noninvasive brain imaging: computed tomography and radionuclides (Book), 3:45384
Radionuclide computerized tomography for brain study, 3:45388
NEURONS
See NERVE CELLS
NEUTRAL ATOM BEAM INJECTION/FOCUSING
New lens system using toroidal magnetic field for intense ion beams, 3:46107 (N-77-33981)
NEUTRAL BEAM SOURCES
See also ION SOURCES
Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub-7117/25)
NEUTRAL-CURRENT INTERACTIONS/DEEP INELASTIC SCATTERING
Deep-inelastic neutral-current cross sections, 3:45603
NEUTRAL-CURRENT INTERACTIONS/P INVARIANCE
Symmetry breaking and naturalness of parity conservation in weak neutral currents in left-right-symmetric gauge theories, 3:45649
NEUTRINO REACTIONS/DEEP INELASTIC SCATTERING
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624

NEUTRINO REACTIONS/HEAVY LIQUID BUBBLE CHAMBERS
Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber, 3:45571
NEUTRINO REACTIONS/PARTICLE PRODUCTION
Observation of the possible formation and decay of a short-lived heavy neutral particle in the neutrino experiment in the SKAT chamber, 3:45571
NEUTRINO-DEUTERON INTERACTIONS/DEEP INELASTIC SCATTERING
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
Hadronic polarization in neutrino scattering, 3:45612
NEUTRINO-NUCLEON INTERACTIONS
See also ANTINEUTRINO-NUCLEON INTERACTIONS NEUTRINO-PROTON INTERACTIONS
NEUTRINO-NUCLEON INTERACTIONS/CHARGED-CURRENT INTERACTIONS
Experimental mean y values and intergrated structure functions for neutrino and antineutrino scattering at high energy, 3:45566
NEUTRINO-NUCLEON INTERACTIONS/COHERENT SCATTERING
Neutrino oscillations in matter, 3:45618
NEUTRINO-NUCLEON INTERACTIONS/DEEP INELASTIC SCATTERING
Determination of the weak neutral-current couplings, 3:45616
Experimental mean y values and intergrated structure functions for neutrino and antineutrino scattering at high energy, 3:45566
Neutral-current coupling in high-energy neutrino interactions, 3:45569
NEUTRINO-NUCLEON INTERACTIONS/ELASTIC SCATTERING
Determination of the weak neutral-current couplings, 3:45616
Gauge models of the VV + AA type and their effective neutrino interactions, 3:45605
NEUTRINO-NUCLEON INTERACTIONS/EXCLUSIVE INTERACTIONS
Determination of the weak neutral-current couplings, 3:45616
NEUTRINO-NUCLEON INTERACTIONS/INELASTIC SCATTERING
Measurement of the neutral-current interactions of high-energy neutrinos and antineutrinos, 3:45570
NEUTRINO-NUCLEON INTERACTIONS/MULTIPLE PRODUCTION
Electromagnetic backgrounds in neutrino-produced trimuon events, 3:45599
Origins of neutrino events with three muons, 3:45617
NEUTRINO-NUCLEON INTERACTIONS/NEUTRAL-CURRENT INTERACTIONS
Neutral-current coupling in high-energy neutrino interactions, 3:45569
NEUTRINO-NUCLEON INTERACTIONS/PCAC THEORY
Possible test of the PCAC hypothesis in neutrino reactions, 3:45625
NEUTRINO-NUCLEON INTERACTIONS/TOTAL CROSS SECTIONS
Measurement of the neutral-current interactions of high-energy neutrinos and antineutrinos, 3:45570
NEUTRINO-NUCLEON INTERACTIONS/UNIFIED GAUGE MODELS
Gauge models of the VV + AA type and their effective neutrino interactions, 3:45605
NEUTRINO-NUCLEON INTERACTIONS/WEAK NEUTRAL CURRENTS
Determination of the weak neutral-current couplings, 3:45616
Measurement of the neutral-current interactions of high-energy neutrinos and antineutrinos, 3:45570
NEUTRINO-PROTON INTERACTIONS/PARTICLE PRODUCTION
Diffractive production of vector mesons in high-energy neutrino interactions, 3:45567
NEUTRINOS
See also SOLAR NEUTRINOS
NEUTRINOS/OSCILLATIONS
Lepton mixing and neutrino oscillations, 3:45622
Weak-interaction-induced neutrino oscillations, 3:45619
NEUTRINOS/TRANSMISSION
Neutrino oscillations in matter, 3:45618
NEUTRON DETECTION/SOLID SCINTILLATION DETECTORS
Pulse-shape discrimination of high-energy neutrons and gamma rays in NaI(Tl), 3:45256
NEUTRON DETECTORS
See also SELF-POWERED NEUTRON DETECTORS
NEUTRON DETECTORS/DESIGN
Apparatus for measuring a flux of neutrons (Patent), 3:44623
NEUTRON DIFFRACTION/SLABS
Polynomial solutions to the tensorial differential equations for monoenergetic neutrons in slab and sphere geometries, 3:45818
NEUTRON DIFFRACTION/SPHERICAL CONFIGURATION
Polynomial solutions to the tensorial differential equations for monoenergetic neutrons in slab and sphere geometries, 3:45818
NEUTRON FLUX/GLOBAL ANALYSIS
Simultaneous global calculation of flux and importance with forward Monte Carlo, 3:45820
NEUTRON FLUX/INTEGRALS
Evaluation of the neutron flux-depression factor via the integral transform method, 3:45819
NEUTRON FLUX/THREE-DIMENSIONAL CALCULATIONS
Monte Carlo Track Rotation Estimator, 3:45821
NEUTRON REACTIONS/CAPTURE
Angular distribution measurements for radiative capture of fast neutrons by ^{4}0Ca, 3:45727
Neutron capture cross-section ratios of ^{240}Pu, ^{242}Pu, ^{238}U, and ^{197}Au in the energy range from 10 to 90 keV, 3:45771
Observation of primary E2 transitions in the reaction ^{2}07Pb(n, y), 3:45754
Parameters of terbium neutron resonances, 3:45752
Precise measurement of the capture width of the 6.67-eV neutron resonance of uranium-238 (Cross sections), 3:45770
States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
NEUTRON REACTIONS/CROSS SECTIONS
Perturbation formalism for the complex poles and widths of the transition matrix with an application to intermediate structure phenomena, 3:45720
NEUTRON REACTIONS/ELASTIC SCATTERING
Sum rules for elastic nd scattering, 3:45686
NEUTRON REACTIONS/FAST FISSION
Review and combination of experimental results for neutron emission per fission of ^{232}Th (1 to 16 MeV), 3:45772 (ORNL/TM-6245)
NEUTRON REACTIONS/FISSION
Fission product yields from 6-9 MeV neutron-induced fission of ^{2}35U and ^{2}38U, 3:45777
General correlation for independent fission product yield uncertainties, 3:45774
Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron (Cross sections, neutron and gamma spectra), 3:45718
Measurements of the neutron-induced fission cross sections of ^{240}Pu, ^{242}Pu, and ^{244}Pu relative to ^{235}U from 0.1 to 30 MeV, 3:45775
Measurements of the average number of prompt neutrons emitted per fission of ^{239}Pu and ^{235}U (0.005 eV to 10 MeV), 3:45773 (ORNL/TM-6246)
Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{1}22Ag, 3:45739
NEUTRON REACTIONS/INELASTIC SCATTERING
Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron (Cross sections, neutron and gamma spectra), 3:45718
NEUTRON REACTIONS/INTERMEDIATE STRUCTURE
Particle-vibrator model for intermediate structure in neutron scattering from ^{5}6Fe, 3:45719
NEUTRON REACTIONS/KNOCK-OUT REACTIONS
Half-life of ^{9}2Nb/sup g/, 3:45741
NEUTRON REACTIONS/QUASI-FREE REACTIONS
Neutron-induced deuteron production from light nuclei at 800 MeV, 3:45704
NEUTRON REACTIONS/S MATRIX
Perturbation formalism for the complex poles and widths of the transition matrix with an application to intermediate structure phenomena, 3:45720
NEUTRON REACTIONS/SCATTERING LENGTHS
Neutron scattering lengths for ^{3}He, 3:45690
NEUTRON REFLECTORS/ALBEDO
Neutron quasialbedos from plane reflectors, 3:45824
NEUTRON SOURCES
(Excludes reactors even when used as neutron sources.)
NEUTRON SOURCES/CALIBRATION
Transport of neutron and secondary gamma radiations through a liquid air sphere surrounding a 14-MeV neutron source, 3:45826
NEUTRON SOURCES/DESIGN
Mobile prompt-gamma in vivo neutron activation facility (^{238}Pu, Be), 3:45379 (BNL-24290)
NEUTRON SPECTRA/ERRORS
Sensitivity analysis for shielding data evaluation by interactive graphics computing, 3:45823
NEUTRON STARS/PION CONDENSATION
Vacuum polarization in strong fields and pion condensation, 3:45789

NEUTRON TRANSPORT/SLABS
Polynomial solutions to the tensorial differential equations for monoenergetic neutrons in slab and sphere geometries, 3:45818
NEUTRON TRANSPORT/SPHERICAL CONFIGURATION
Polynomial solutions to the tensorial differential equations for monoenergetic neutrons in slab and sphere geometries, 3:45818
NEUTRON TRANSPORT THEORY
Data preparation for calculations with the Monte-Carlo method on the base of the 26-group constant system, 3:44733 (IAE-2526)
NEUTRON TRANSPORT THEORY/RESEARCH PROGRAMS
Transport and reactor theory. Progress report, January 1-March 31, 1978, 3:44734 (LA-7271-PR)
NEUTRON-GAMMA LOGGING/DATA ANALYSIS
Experience in application of a probability model for interpreting the results of geological and well logging studies of fractured reservoirs, 3:44149
NEUTRON-GAMMA LOGGING/DATA PROCESSING
Neutron borehole logging correction technique (Patent), 3:45278
NEUTRON-NEUTRON LOGGING/EQUIPMENT
Log-inject-log in sand consolidation (Patent; for determining adequacy of placement of sand consolidating plastic), 3:44147
NEUTRONS
See also FAST NEUTRONS
FISSION NEUTRONS
NEUTRONS/ACTIVATION ANALYSIS
Mobile prompt-gamma in vivo neutron activation facility (^{238}Pu, Be), 3:45379 (BNL-24290)
NEUTRONS/RADIATION STREAMING
Neutrons streaming through conical ducts, 3:45822
NEUTRONS/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
NEUTRONS/SAFETY STANDARDS
Shielding standards: a case history, 3:45825
NEVADA/URANIUM DEPOSITS
Distribution of uranium in sediment samples as determined by multi-element analysis, 3:44221 (USGS-CIRC-753)
Hydrogeochemistry of uranium in the Walker River Basin, California and Nevada, 3:44233 (USGS-CIRC-753)
NEVADA TEST SITE
Assessment of the Nevada Test Site for low-level waste management, 3:44291 (NVO-193)
NEVADA TEST SITE/NUCLEAR EXPLOSIONS
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
NEW MEXICO/GEOCHEMICAL SURVEYS
Uranium hydrogeochemical and stream sediment reconnaissance data release for the New Mexico portions of the Douglas, Silver City, Clifton, and Saint Johns NTMS quadrangles, New Mexico/Arizona, 3:44215 (LA-7180-MS)
NEW MEXICO/URANIUM DEPOSITS
Anomalous uranium in the waters of the Rio Ojo Caliente, New Mexico, 3:44236 (USGS-CIRC-753)
NEW YORK/SCHOOL BUILDINGS
Report on the development of a model energy conservation program for New York State schools. Report on phase 1, January-July 77, 3:44948 (PB-274285)
NICARAGUA/GEOTHERMAL RESOURCES
Active volcanoes and their relation to geothermal energy, 3:44569 (NP-22160)
NICARAGUA/VOLCANISM
Active volcanoes and their relation to geothermal energy, 3:44569 (NP-22160)
NICKEL/BIOLOGICAL EFFECTS
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
NICKEL/CATALYTIC EFFECTS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
NICKEL/CHARGED-PARTICLE TRANSPORT
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
NICKEL/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
NICKEL/CHEMICAL REACTIONS
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
NICKEL/ECOLOGICAL CONCENTRATION
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
NICKEL/ELECTRODEPOSITION
Mechanical properties of sulfamate nickel electrodeposits, 3:45014 (SAND-77-8042)
NICKEL/ENVIRONMENTAL TRANSPORT
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
NICKEL/MECHANICAL PROPERTIES
Mechanical properties of sulfamate nickel electrodeposits, 3:45014 (SAND-77-8042)
NICKEL/PHYSICAL RADIATION EFFECTS
Growth kinetics and 'preference factor' of Frank loops in nickel during electron irradiation (450°C), 3:45056
NICKEL 58 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
NICKEL 58 TARGET/OXYGEN 16 REACTIONS
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
NICKEL 58 TARGET/PION MINUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
NICKEL 58 TARGET/PION PLUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
NICKEL 58 TARGET/PROTON REACTIONS
Analyzing power in proton-nucleus elastic scattering at 0.8 GeV, 3:45702
NICKEL 60/ENERGY LEVELS
Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu (Wood-Saxon and Nilsson potentials, spin-cutoff parameters, m value, π, J, partition function inversion), 3:45717
NICKEL 60 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
NICKEL 61/ENERGY LEVELS
Multiparticle configurations in the odd-neutron nuclei ^{6}1Ni and ^{6}7Zn populated by decay of ^{6}1Cu, ^{6}7Cu, and ^{6}7Ga, 3:45730
NICKEL 62/ENERGY LEVELS
Calculation of nuclear level densities for ^{56}Fe, ^{59}Co, ^{60}Ni, ^{61}Cu, ^{62}Ni, ^{63}Cu, and ^{65}Cu (Wood-Saxon and Nilsson potentials, spin-cutoff parameters, m value, π, J, partition function inversion), 3:45717
NICKEL 62 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
NICKEL 63/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
NICKEL 64 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
NICKEL 64 TARGET/DEUTERON REACTIONS
Effect of breakup on the spin dependence of the deuteron-nucleus interaction, 3:45728
NICKEL 65/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
NICKEL 65/ISOMERIC TRANSITIONS
Mass and low-lying levels of ^{6}7Ge; trends in the structure of /sup 63,65/Ni, /sup 65,67/Zn, and /sup 67,69/Ge, 3:45732
NICKEL BASE ALLOYS
See also INCONEL ALLOYS
NICKEL BASE ALLOYS/CORROSION
Friction, wear, and corrosion of laves-hardened nickel alloy hardsurfacing in sodium, 3:44695 (HEDL-SA-1391)
NICKEL BASE ALLOYS/FRACTURE PROPERTIES
Analysis of the ductile-brittle transition temperature in Fe-binary alloys. Final report, May 1974-July 1977, 3:45015 (TID-28431)
NICKEL COMPOUNDS/CATALYTIC EFFECTS
Process for improved carbon-supported hydrodesulfurization catalysts (Patent), 3:44159
NICKEL ISOTOPES/PROTON REACTIONS
Isotopic dependence of the yield of ^{1}7N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
NICKEL OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
NICKEL OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
NICKEL SULFIDES/CHEMICAL PREPARATION
Section I. Tension analysis of the system nickel monosulfide/nickel disulfide/sulfur, 3:45121 (UCRL-Trans-11350)
NICKEL-CADMIUM BATTERIES/ELECTRODES
Review of electrochemical impregnation for nickel/cadmium cells, 3:44852 (N-77-33601)
NIOBIUM/CHEMICAL REACTIONS
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)

NIOBIUM/ENVIRONMENTAL TRANSPORT
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
NIOBIUM/JOSEPHSON EFFECT
High-frequency properties of superconducting weak couplings, 3:45037
NIOBIUM/NEUTRON TRANSPORT
Integral tests of niobium cross sections through simultaneous measurements of neutron and gamma-ray leakage spectra, 3:45816
NIOBIUM/PHOTON TRANSPORT
Integral tests of niobium cross sections through simultaneous measurements of neutron and gamma-ray leakage spectra, 3:45816
NIOBIUM 92/GROUND STATES
Half-life of ^{92}Nb/sup g/, 3:45741
NIOBIUM 93 TARGET/NEUTRON REACTIONS
Half-life of ^{92}Nb/sup g/, 3:45741
NIOBIUM ALLOYS
See also NIOBIUM BASE ALLOYS
NIOBIUM ALLOYS/CRITICAL FIELD
Critical magnetic fields of superconducting compounds based on Nb_3Ge obtained at high pressures and temperatures, 3:45035
NIOBIUM ALLOYS/SUPERCONDUCTIVITY
Superconducting properties of in situ prepared Nb-Cu-Sn alloys, 3:45021
NIOBIUM BASE ALLOYS/CHEMICAL PREPARATION
Multisource deposition rate control using a mass spectrometer as a sensing element, 3:45006
NIOBIUM BASE ALLOYS/CRYSTAL STRUCTURE
Diffuse neutron scattering in Nb-Zr alloys, 3:45026
NIOBIUM BASE ALLOYS/NEUTRON DIFFRACTION
Diffuse neutron scattering in Nb-Zr alloys, 3:45026
NIOBIUM BASE ALLOYS/SUPERCONDUCTIVITY
Critical-current changes in neutron-irradiated Nb_3Sn as a function of irradiation temperature and initial metallurgy, 3:45057
NIOBIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
NITRIC OXIDE/ABSORPTION SPECTRA
Measurements of nitric oxide ion vibrational absorption coefficient and vibrational transfer to N_2, 3:45481 (AD-A-048628)
NITRILES
See also ACRYLONITRILE
NITRILES/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
NITRO COMPOUNDS/TITRATION
Titrimetry is alive and well at LLL, 3:45110 (UCRL-80878)
NITROGEN/BIOLOGICAL REGENERATION
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)
NITROGEN/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535
NITROGEN/REMOVAL
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, October-December 1977, 3:44208 (FE-2315-22)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
NITROGEN 13/RADIONUCLIDE KINETICS
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
NITROGEN 14 REACTIONS/FRAGMENTATION
Fragmentation of ^{4}He, ^{12}C, ^{14}N, and ^{16}O nuclei in nuclear emulsion at 2.1 GeV/nucleon, 3:45688
NITROGEN 15 REACTIONS/FUSION REACTIONS
Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. /sup 57,58/Fe, /sup 54,55/Cr, and /sup 57,58/Mn, 3:45724
NITROGEN 17/ISOTOPE PRODUCTION
Isotopic dependence of the yield of ^{17}N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
NITROGEN DIOXIDE/MONITORING
The 1976 NRL air quality data. Final report, 3:45289 (AD-A-048750)
NITROGEN OXIDES
See also NITRIC OXIDE
NITROGEN DIOXIDE
NITROGEN OXIDES/AIR POLLUTION CONTROL
Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report, 3:44624 (PB-274395)
NITROSO COMPOUNDS/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
NMR
See NUCLEAR MAGNETIC RESONANCE
NOISE POLLUTION
Perspectives on the environment, 3:45294 (NP-23191)
NONAXIAL NUCLEI
See DEFORMED NUCLEI
NORTH CAROLINA/COASTAL REGIONS
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
NORTH CAROLINA/ENERGY CONSUMPTION
Energy consumption in North Carolina, 1975 and 1976, 3:44916 (PB-274075)
NORTH CAROLINA/FUEL CONSUMPTION
Energy consumption in North Carolina, 1975 and 1976, 3:44916 (PB-274075)
NORTH CAROLINA/GEOLOGY
Geology of the Raleigh 1° x 2° Quadrangle, North Carolina, 3:44212 (GJBX-51(78))
NORTH CAROLINA/METEOROLOGY
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
NORTHERN IRELAND
See UNITED KINGDOM
NOZZLES/CORROSION
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1-December 30, 1977, 3:44615 (FE-1765-42)
NPR REACTOR
See N-REACTOR
N-REACTOR/SPECIFICATIONS
Technical criteria and bases: pressurized water-cooled, graphite moderated production reactor, 3:44791 (HW-53612(Rev.2))
N-REACTOR/SPENT FUEL STORAGE
Fuel storage basin: criticality safety analysis report and technical basis, 3:44789 (DUN-NUSAR-7824)
NUCLEAR ALIGNMENT
Establishment of equilibrium between the nuclear and electron subsystems on dynamic cooling of nuclei, 3:45681
NUCLEAR ENGINEERING
Foundations of nuclear engineering (Book), 3:44610
NUCLEAR ENGINEERING/EDUCATION
Educational programs and facilities in nuclear science and engineering, 3:45133 (TID-28375)
NUCLEAR EVAPORATION
See EVAPORATION MODEL
NUCLEAR EXPLOSIONS
See also RIO BLANCO EVENT
UNDERGROUND EXPLOSIONS
NUCLEAR EXPLOSIONS/DIAGNOSTIC TECHNIQUES
Proof test of the ATLAS Trailer Shock Isolation System, 3:45284 (UCRL-50016-78-1)
NUCLEAR EXPLOSIONS/FISSION PRODUCTS
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
NUCLEAR EXPLOSIONS/GLOBAL FALLOUT
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
NUCLEAR EXPLOSIONS/SHOCK WAVES
Development of an artificial viscosity function. Final report, 3:45283 (AD-A-048778)
NUCLEAR FACILITIES
See also FEED MATERIALS PLANTS
FUEL FABRICATION PLANTS
FUEL REPROCESSING PLANTS
NUCLEAR FACILITIES/PHYSICAL PROTECTION DEVICES
Description, operation, and diagnostic routines for the adaptive intrusion data system, 3:44310 (SAND-77-1029)
Systematic approach to the conceptual design of physical protection systems for nuclear facilities, 3:44306 (HCP/D0789-01)
NUCLEAR FACILITIES/SAFEGUARDS
Capability for intrusion detection at nuclear fuel sites, 3:44309 (NUREG/CR-0027)
NUCLEAR FACILITIES/SAFETY ENGINEERING
Report to Congress on abnormal occurrences, October-December 1977, 3:45427 (NUREG-0090-10)
NUCLEAR FACILITIES/SECURITY
Capability for intrusion detection at nuclear fuel sites, 3:44309 (NUREG/CR-0027)
Overview of the M.A.I.T. analysis system (machine analysis of the internal threat) (Collusion and illicit use of access), 3:44314 (UCRL-81005)

NUCLEAR FUELS
See also FUEL ELEMENTS
SPENT FUELS
NUCLEAR FUELS/ACTIVITY LEVELS
Prediction of fission product and actinide levels in irradiated fuel and cladding, 3:44738
NUCLEAR INDUSTRY/MEETINGS
Nuclear energy and society. Volume 4. Nuclear energy and the industry (part 1), 3:44729 (CONF-760688-)
NUCLEAR MAGNETIC RESONANCE/SQUID DEVICES
Recent advances in SQUID NMR techniques, 3:45138 (CONF-780339-3)
NUCLEAR MATERIALS DIVERSION
Homemade nuclear bomb syndrome, 3:44316
Overview of the M.A.I.T. analysis system (machine analysis of the internal threat) (Collusion and illicit use of access), 3:44314 (UCRL-81005)
NUCLEAR MATERIALS MANAGEMENT/ACCOUNTING
INMACS - An approach to on-line nuclear materials accounting and control in a fuel fabrication environment, 3:44305 (AECL-5902)
NUCLEAR MATERIALS MANAGEMENT/NONDESTRUCTIVE ANALYSIS
Feasibility of nondestructive assay measurements in uranium enrichment plants, 3:44308 (LA-7212-MS)
NUCLEAR MATTER/CHEMICAL COMPOSITION
Nuclear matter with the retention of neutrinos, 3:45449
NUCLEAR MATTER/COMPRESSION
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
NUCLEAR MATTER/HYDRODYNAMIC MODEL
Dynamics of nuclear fluid. IV. Some spin and isospin properties in the hydrodynamical model, 3:45788
NUCLEAR MATTER/NUCLEON-NUCLEON POTENTIAL
One-boson exchange potentials and their use in low energy nuclear physics, 3:45791
NUCLEAR MATTER/PION CONDENSATION
Limitations on the parameters of the superdense state of nuclei, 3:45786
Relaxation of pion fields in nuclear matter, 3:45790
Vacuum polarization in strong fields and pion condensation, 3:45789
NUCLEAR MATTER/RELAXATION
Relaxation of pion fields in nuclear matter, 3:45790
NUCLEAR MATTER/SHOCK WAVES
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
NUCLEAR MEDICINE
See also BIOMEDICAL RADIOGRAPHY
RADIOISOTOPE SCANNING
RADIOPHARMACEUTICALS
RADIOTHERAPY
SCINTISCANNING
NUCLEAR MEDICINE/REVIEWS
Review of the use of ionizing radiation for the treatment of benign diseases. Volume I. Committee's report. Final report, 3:45380 (PB-274032)
NUCLEAR MEDICINE/TOMOGRAPHY
Reconstruction tomography in diagnostic radiology and nuclear medicine (Book), 3:45382
NUCLEAR PHYSICS/RESEARCH PROGRAMS
Studies of nuclear processes. Progress report, 1 January 1977-31 December 1977 (Univ. of North Carolina, Chapel Hill), 3:45680 (ORO-2408-124)
NUCLEAR POWER/COST
Hidden costs of nuclear energy, 3:44719
NUCLEAR POWER/MARKET
IAEA nuclear power forecast for developing countries, 3:44718 (CONF-760688-)
NUCLEAR POWER/MEETINGS
Nuclear energy and society. Volume 4. Nuclear energy and the industry (part 1), 3:44729 (CONF-760688-)
NUCLEAR POWER/PLANNING
Decisions of the way to the future energy supply - a fatal question for society, 3:44720
Fundamental studies of system investigations in nuclear energetics (USSR), 3:44721
Future developments in nuclear power, 3:44716 (AECL-5800)
NUCLEAR POWER/PUBLIC RELATIONS
Responsibility of research for the future of society, 3:44868
NUCLEAR POWER PLANTS/ANTITRUST REVIEW
Antitrust review of nuclear power plants. Recent developments, 3:44711 (NUREG-0447)
NUCLEAR POWER PLANTS/BIDS
Economic evaluation of bids for nuclear power plants. A guidebook, 3:44723
NUCLEAR POWER PLANTS/CHEMICAL EFFLUENTS
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID-17744-78-2)
NUCLEAR POWER PLANTS/CONSTRUCTION
Planning, design, and construction of nuclear power plants: an overview. Final report, 3:44635 (COO-4121-2)
NUCLEAR POWER PLANTS/DESIGN
Nuclear power. Volume 1. Nuclear power plant design (Book), 3:44636
Planning, design, and construction of nuclear power plants: an overview. Final report, 3:44635 (COO-4121-2)
NUCLEAR POWER PLANTS/DISTRICT HEATING
Use of nuclear energy for district heating, 3:44728
NUCLEAR POWER PLANTS/ELECTRIC CABLES
Electrical wire for use in nuclear generating stations (Patent), 3:44763
NUCLEAR POWER PLANTS/INSPECTION
Revised inspection program for nuclear power plants, 3:44710 (NUREG-0397)
NUCLEAR POWER PLANTS/INVESTMENT
Economic evaluation of bids for nuclear power plants. A guidebook, 3:44723
NUCLEAR POWER PLANTS/MANAGEMENT
Nuclear power. Volume 2. Nuclear power project management (Book), 3:44637
NUCLEAR POWER PLANTS/PLANNING
Different reactor types and the Belgian option, 3:44722
Improving regulatory effectiveness in Federal/State siting actions. Need for power: determinants in the state decisionmaking processes, 3:44712 (NUREG/CR-0022)
Planning, design, and construction of nuclear power plants: an overview. Final report, 3:44635 (COO-4121-2)
NUCLEAR POWER PLANTS/PUBLIC RELATIONS
Nuclear safety. A basic controversy, 3:44832
NUCLEAR POWER PLANTS/RADIATION MONITORING
Criteria for uses of built-in exposure rate and airborne radioactivity monitoring systems in nuclear power plants, 3:44829
Digital radiation monitoring system employing distributed microprocessors, 3:44830
NUCLEAR POWER PLANTS/REACTOR ACCIDENTS
Investigations of the adequacy of the meteorological transport model developed for the reactor safety study, 3:44811 (SAND-78-0574C)
NUCLEAR POWER PLANTS/REACTOR DISMANTLING
View toward the disposition of retired nuclear power stations, 3:44833 (ORNL-tr-4660)
NUCLEAR POWER PLANTS/REACTOR LICENSING
Power Reactor Docket Information, 3:44713 (NUREG/PRDI-78/6)
NUCLEAR POWER PLANTS/REACTOR SAFETY
Nuclear safety. A basic controversy, 3:44832
NUCLEAR POWER PLANTS/SAFETY ENGINEERING
Report to Congress on abnormal occurrences, October-December 1977, 3:45427 (NUREG-0090-10)
NUCLEAR POWER PLANTS/SECURITY
Fault tree analysis for vital area identification, 3:44312 (SAND-78-0364C)
NUCLEAR POWER PLANTS/SHIELDING
Optimisation of shielding for direct-cycle steam turbine plant, 3:44765
Simple albedo method for calculating effects of single-legged ducts (GRID code), 3:44739
NUCLEAR POWER PLANTS/THORIUM CYCLE
Economics and utilization of thorium in nuclear reactors, 3:44724 (ORNL/TM-6331)
NUCLEAR POWER PLANTS/WASTE HEAT UTILIZATION
Utilization of waste heat from electricity generating stations, 3:44869 (AECL-5689)
NUCLEAR REACTION KINETICS
Backward peaks of the cross section in nuclear reactions and exchange processes (> or = 15 MeV), 3:45804
NUCLEAR REACTION YIELD/BOLTZMANN STATISTICS
Volume versus surface sampling of Maxwellian distributions in nuclear reactions, 3:45793
NUCLEAR REACTIONS
See also ALPHA REACTIONS
ARGON 40 REACTIONS
BORON 11 REACTIONS
CARBON 12 REACTIONS
CARBON 13 REACTIONS
CHARGE-EXCHANGE REACTIONS
COMPOUND-NUCLEUS REACTIONS

DEUTERON REACTIONS
ELECTRON REACTIONS
FISSION
FLUORINE 19 REACTIONS
FUSION REACTIONS
HEAVY ION REACTIONS
LEPTON REACTIONS
LITHIUM 6 REACTIONS
MUON REACTIONS
NEON 20 REACTIONS
NEUTRINO REACTIONS
NEUTRON REACTIONS
NITROGEN 14 REACTIONS
NUCLEON REACTIONS
OXYGEN 16 REACTIONS
OXYGEN 18 REACTIONS
PHOTONUCLEAR REACTIONS
PION REACTIONS
PROTON REACTIONS
TRITON REACTIONS
Interactions of high-energy particles and atomic nuclei with nuclei (chapter 7 thru 11) (Unedited machine translation from Russian book), 3:45798 (AD-A-048311)

NUCLEAR REACTIONS/EXCHANGE INTERACTIONS
Asymptotic behavior of partial amplitudes in three-particle reactions with rearrangement of particles, 3:45800

NUCLEAR REACTIONS/MULTIPLE PRODUCTION
Production of relativistic particles on nuclei at large angles and the role of multiple processes, 3:45642

NUCLEAR REACTORS
See REACTORS

NUCLEAR SHIP MUTSU REACTOR
See MUTSU REACTOR

NUCLEAR SPIN RESONANCE
See NUCLEAR MAGNETIC RESONANCE

NUCLEAR STRUCTURE/HARTREE-FOCK METHOD
Extended time-dependent Hartree-Fock approximation with particle collisions, 3:45780

NUCLEAR WEAPON TESTS
See NUCLEAR EXPLOSIONS

NUCLEAR WEAPONS
Neutron bomb, 3:45287 (LA-tr-78-48)

NUCLEAR WEAPONS/FABRICATION
Homemade nuclear bomb syndrome, 3:44316

NUCLEAR WEAPONS/PERFORMANCE
Tactical implications of air blast variations from nuclear tests. Final report, 15 April-30 November 1976, 3:45286 (AD-A-048802)

NUCLEI
See also DEFORMED NUCLEI
EVEN-EVEN NUCLEI
HEAVY NUCLEI
INTERMEDIATE MASS NUCLEI
LIGHT NUCLEI

NUCLEI/MASS FORMULAE
Nuclear mass relations and equations, 3:45782

NUCLEI/SURFACE TENSION
Calculation of the coefficient of surface tension of a nucleus, 3:45783

NUCLEON REACTIONS/BACKSCATTERING
Particles emitted backward in the lab in hadron-nucleus interactions at $>$ or ≈ 1 TeV, 3:45579

NUCLEON REACTIONS/NUCLEAR CASCADES
High energy ($E <$ or $=$ 1000 GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data, 3:45641

NUCLEON REACTIONS/TOTAL CROSS SECTIONS
High energy ($E <$ or $=$ 1000 GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data, 3:45641

NUCLEON-ANTINUCLEON INTERACTIONS
See also PROTON-ANTIPROTON INTERACTIONS

NUCLEON-ANTINUCLEON INTERACTIONS/ANNIHILATION
Annihilation widths and shifts of quasinuclear NN-bar levels in the coupled-channel model, 3:45856

NUCLEON-ANTINUCLEON INTERACTIONS/TENSOR FORCES
Strong tensor forces and the possibility of high-spin states in the nucleon-antinucleon system, 3:45632

NUCLEON-NUCLEON INTERACTIONS
See also PROTON-NEUTRON INTERACTIONS
PROTON-PROTON INTERACTIONS

NUCLEON-NUCLEON INTERACTIONS/OBE MODEL
One-boson exchange potentials and their use in low energy nuclear physics, 3:45791

NUCLEON-NUCLEON POTENTIAL/SYMMETRY BREAKING
Nonlocal contributions to the rho-ω mixing charge-symmetry-breaking force, 3:45682

NUCLEONS
See also NEUTRONS
PROTONS

NUCLEONS/ELECTROMAGNETIC FORM FACTORS
Determination of the electromagnetic radii of the nucleon, 3:45608

NUCLEONS/PARTICLE RADII
Determination of the electromagnetic radii of the nucleon, 3:45608

NUTRIENTS/BIOLOGICAL REGENERATION
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)

O

O GROUPS/SYMMETRY BREAKING
Spontaneous symmetry breaking and nonlinear invariant Lagrangians: Applications to SU(2) x U(1) and OSp(1/4), 3:45646

OCEAN THERMAL POWER PLANTS/HEAT EXCHANGERS
Reply to comments on seawater side enhancement for OTEC heat exchangers, 3:44400 (CONF-770331-)

OCEANS
See SEAS

OCTANE/ADSORPTION ISOTHERMS
Adsorption of vapors of organic substances on coal, 3:44078

OFFICE BUILDINGS/BUILDING MATERIALS
Solarized office: architectural implications in office planning and design, utilizing direct solar gain by means of 'solar modulators', 'transparent insulation', and 'solar storage tiles', 3:44403 (CONF-761220-)

OFFICE BUILDINGS/LATENT HEAT STORAGE
Solarized office: architectural implications in office planning and design, utilizing direct solar gain by means of 'solar modulators', 'transparent insulation', and 'solar storage tiles', 3:44403 (CONF-761220-)

OFFICE BUILDINGS/SOLAR COOLING SYSTEMS
Solar cooling of a 25,000 square foot office building, 3:44422 (CONF-761220-)

OFFICE BUILDINGS/SOLAR HEATING SYSTEMS
Simulation of the sclar assisted heating and snow-melting system of a commercial bank building in Buffalo, New York, 3:44465 (CONF-761220-)
Solar cooling of a 25,000 square foot office building, 3:44422 (CONF-761220-)

OFFICE BUILDINGS/SOLAR SPACE HEATING
Solar plant and large-scale store for office buildings. Operational experience confirms: 42 m^2 collector area and a 15 m^3 store save 6,800 l heating fuel oil annually, 3:44449

OFFICE BUILDINGS/SOLAR WATER HEATING
Solar plant and large-scale store for office buildings. Operational experience confirms: 42 m^2 collector area and a 15 m^3 store save 6,800 l heating fuel oil annually, 3:44449

OFFICE BUILDINGS/VENTILATION
Estimating the energy conservation potential of ventilation control through weather data analysis. Final report, 3:44946 (PB-273949)

OFF-PEAK ENERGY STORAGE/FLYWHEELS
Power supply with flywheel storage (Patent), 3:44840

OFF-PEAK ENERGY STORAGE/REDOX FUEL CELLS
Redox bulk energy storage system study. Volume 1. Final report, 18 February 1976-30 January 1977, 3:44908 (N-77-33608)
Redox bulk energy storage system study. Volume 2. Final report, 18 February 1976-30 January 1977, 3:44909 (N-77-33609)

OFF-PEAK ENERGY STORAGE/THERMAL ENERGY STORAGE EQUIPMENT
Conservation of electrical energy (Patent), 3:44621

OFF-PEAK POWER/TECHNOLOGY UTILIZATION
Electric Utility Rate Design Study: technology for utilizing off-peak energy, Topic 8, 3:44889 (NP-22552)

OFFSHORE OPERATIONS/ENVIRONMENTAL IMPACTS
Recommendations for microbiological studies in the Continental Shelf Areas. Results from two workshops convened 10-11 August 1976 and 19-20 October 1976 in Boulder, Colorado. Outer Continental Shelf environmental assessment program. Technical memo, 3:44143 (PB-274660)

OFFSHORE SITES/AQUATIC ECOSYSTEMS
Recommendations for microbiological studies in the Continental Shelf Areas. Results from two workshops convened 10-11 August 1976 and 19-20 October 1976 in Boulder, Colorado. Outer Continental Shelf environmental assessment program. Technical memo, 3:44143 (PB-274660)

OIL RESIDUES
See PETROLEUM RESIDUES
OIL SHALE DEPOSITS/LITHOLOGY
Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October-December 1977, 3:44203 (FE-2346-20)
OIL SHALE DEPOSITS/STRATIGRAPHY
Energy from in situ processing of Antrim oil shale. Quarterly technical progress report, October-December 1977, 3:44203 (FE-2346-20)
OIL SHALE INDUSTRY/TECHNOLOGY ASSESSMENT
Electric power and synthetic fuels industries in the southwest: production and environmental control technologies, 3:44090 (PB-273847)
OIL SHALE MINING
See also SURFACE MINING
UNDERGROUND MINING
OIL SHALE MINING/FEASIBILITY STUDIES
Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume I. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report, 3:44201 (PB-274435)
Technical and cost evaluation of candidate large-scale open-pit oil shale mining methods in Colorado. Volume II, Parts 1 and 2. Technical and economic study of an integrated single-pass mining system for open-pit mining of deep oil shale deposits. Final report, 3:44202 (PB-274520)
OIL SHALES
See also BLACK SHALES
OIL SHALES/COMBUSTION
Process for obtaining oil, gas, sulfur, and other products from oil shale (Patent), 3:44206
OIL SHALES/EXPLOSIVE FRACTURING
Explosively produced fracture of oil shale. Progress report, April-June 1977, 3:44200 (LA-6901-PR)
OIL SHALES/GASIFICATION
Process for obtaining oil, gas, sulfur, and other products from oil shale (Patent), 3:44206
OIL SHALES/IN-SITU RETORTING
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976-October 31, 1977. Volume I, 3:44204 (TID-28053/1)
Occidental vertical modified in situ process for the recovery of oil from oil shale: Phase I. Summary report, November 1, 1976-October 31, 1977. Volume II, 3:44205 (TID-28053/2)
OIL SHALES/PYROLYSIS
Process for obtaining oil, gas, sulfur, and other products from oil shale (Patent), 3:44206
OIL SPILLS
Microbial ecology studies of the Metula spill in the Straits of Magellan, 3:45409
Oiled seabird rescue and conservation, 3:44179
OIL SPILLS/BIOLOGICAL EFFECTS
Florida oil spill impact on the Buzzards Bay benthic fauna: West Falmouth, 3:44181
Long-term effects of an oil spill on Fucus macrofauna in a small Baltic bay, 3:44183
Long-term effects of oil spills on marine intertidal communities, 3:44184
Long-term effects of an oil spill on population of the salt-marsh crab Uca pugnax, 3:45414
No. 2 fuel oil spill in Bourne, Massachusetts: immediate assessment of the effects of marine invertebrates and a 3-year study of growth and recovery of a salt marsh, 3:44182
Physiological stresses and response in chronically oiled organisms, 3:45417
Prudhoe crude oil in Arctic marine ice, water, and sediment ecosystems: degradation and interactions with microbial and benthic communities, 3:44176
OIL SPILLS/CLEANING
Recolonization of rocky shores in Cornwall after use of toxic dispersants to clean up the Torrey Canyon spill, 3:44180
OIL SPILLS/ENVIRONMENTAL EFFECTS
Long-term fate of petroleum hydrocarbons after spills: compositional changes and microbial degradation, 3:44175
OIL SPILLS/ENVIRONMENTAL TRANSPORT
Field investigations of convergences and slick concentration mechanisms in Delaware Bay. (Research on the effects of crude oil transfer and upstream refineries on Delaware Bay), 3:45332 (PB-275692)
Project development and technical development plan. New York Bight Project, 3:45358 (PB-276014)
OIL SPILLS/QUANTITATIVE CHEMICAL ANALYSIS
Preliminary assessment of the presence of oil in the ecosystem at Ekofisk after the blowout, April 22-30, 1977, 3:44178
Residues of Bunker C oil in Chedabucto Bay, Nova Scotia, 6 years after the Arrow spill, 3:44177
OIL WELLS
See also PETROLEUM
OIL WELLS/ANCHORS
Anchoring assembly (Patent), 3:44156
OIL WELLS/CARBON DIOXIDE INJECTION
Oil recovery by carbon dioxide injection. Quarterly report, October-December 1976, 3:44151 (ORO-5301-7)
OIL WELLS/ENVIRONMENTAL IMPACTS
Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED-78-93)
OIL WELLS/FLUID INJECTION
Self-operating chemical feeder for an oil well (Patent), 3:44155
OIL WELLS/NEUTRON-NEUTRON LOGGING
Log-inject-log in sand consolidation (Patent; for determining adequacy of placement of sand consolidating plastic), 3:44147
OIL WELLS/OFFSHORE OPERATIONS
Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED-78-93)
OIL WELLS/SAMPLERS
Full-opening annulus pressure operated sampler valve with reverse circulation valve (Patent), 3:44154
OIL WELLS/STEAM INJECTION
DEEP STEAM: Project 16 enhanced oil recovery. Quarterly report, October 1-December 31, 1977, 3:44153 (SAND-78-0313)
OIL WELLS/THERMAL INSULATION
Method and device for the thermal insulation of a deep well, 3:44157
OIL WELLS/WATERFLOODING
Improved secondary oil recovery by controlled water flooding-pilot demonstration, Ranger Zone, Fault Block VII, Wilmington Field: Phase I. Quarterly report, October-December 1977, 3:44152 (SAN-1396-15)
OILS
See also FUEL OILS
MINERAL OILS
SHALE OIL
OILS/WEATHERING
Mechanical dispersal of oil stranded in the littoral zone, 3:45334
OKLAHOMA/URANIUM DEPOSITS
Uranium potential of sedimentary and igneous rocks in western and southwestern Oklahoma, 3:44229 (USGS-CIRC-753)
OKLO PHENOMENON/REVIEWS
Oklo natural nuclear reactor, 3:45778
OKLO PHENOMENON/SEDIMENTATION
Geological follow-up of the mining of the natural reactors of Oklo, 3:44210 (LA-tr-78-26)
OKLO PHENOMENON/STRATIGRAPHY
Geological follow-up of the mining of the natural reactors of Oklo, 3:44210 (LA-tr-78-26)
OLEFINS
See ALKENES
ON-LINE MEASUREMENT SYSTEMS/CORRECTIONS
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
ON-LINE MEASUREMENT SYSTEMS/DATA ANALYSIS
Multilevel crossing rates for automated signal classification, 3:44732 (CONF-780403-3)
ON-LINE MEASUREMENT SYSTEMS/IRRADIATION CAPSULES
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
ON-LINE MEASUREMENT SYSTEMS/PNEUMATIC TRANSPORT
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
ON-LINE MEASUREMENT SYSTEMS/TIME MEASUREMENT
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
ONTARIO PHWR PICKERING-1 REACTOR
See PICKERING-1 REACTOR
ONTARIO PHWR PICKERING-2 REACTOR
See PICKERING-2 REACTOR
ONTARIO PHWR PICKERING-3 REACTOR
See PICKERING-3 REACTOR
ONTARIO PHWR PICKERING-4 REACTOR
See PICKERING-4 REACTOR
ONUMA GEOTHERMAL FIELD/STRATIGRAPHY
Record of drilling of Hachimandaira Onuma well 0-3(R)a, 3:44591 (NP-22302)

ONUMA GEOTHERMAL FIELD/WELL DRILLING
Record of drilling of Hachimandaira Onuma well 0-3(R)a, 3:44591 (NP-22302)
OPHTHALMOLOGY
Review of the use of ionizing radiation for the treatment of benign diseases. Volume I. Committee's report. Final report, 3:45380 (PB-274032)
OPTICAL MODELS/L-S COUPLING
Spin-orbit terms in heavy-ion elastic scattering potentials, 3:45794
OPTICAL MODELS/OXYGEN 16 REACTIONS
$^{16}O + {}^{40}Ca$ inelastic scattering and direct-reaction calculations in heavy-ion scattering, 3:45725
OPTICAL MODELS/PHOTONUCLEAR REACTIONS
Photoneutron reactions near threshold and the optical model of nuclei, 3:45805
OPTICAL MODELS/PION MINUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
OPTICAL MODELS/PION PLUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
OPTICAL MODELS/WOODS-SAXON POTENTIAL
Modified optical potential for the elastic scattering of complex particles, 3:45796
OPTICAL SPECTROMETERS/DESIGN
Efficient intracavity laser Raman spectrometer, 3:45181
OPTICAL SYSTEMS/OPTICAL PROPERTIES
Laser damage phenomenology in materials, 3:46120
ORBITAL SOLAR POWER PLANTS/FEASIBILITY STUDIES
Solar power satellite. Concept evaluation. Activities report. Volume 2. Detailed report. Progress report, July 1976-June 1977, 3:44392 (N-77-33600)
ORGANIC CHLORINE COMPOUNDS
See also DDT
PVC
ORGANIC CHLORINE COMPOUNDS/ENVIRONMENTAL EFFECTS
Distribution of mercury in fish and its form of occurrence, 3:45348
ORGANIC COMPOUNDS
See also CARBOHYDRATES
CHEMICAL FEEDSTOCKS
HYDROCARBONS
KETONES
ORGANIC NITROGEN COMPOUNDS
ORGANIC OXYGEN COMPOUNDS
ORGANIC POLYMERS
ORGANIC SULFUR COMPOUNDS
PROTEINS
ORGANIC COMPOUNDS/LATENT HEAT STORAGE
Application of latent-heat storage element in solar-heated buildings, 3:44557
ORGANIC COMPOUNDS/REMOVAL
Removal of gas chromatographable organic compounds from water by a spray vaporization technique, 3:45116
ORGANIC COMPOUNDS/SORPTION
Sorption phenomenon in the organics of bottom sediments (Mercury, sulfur), 3:45344
ORGANIC COMPOUNDS/TITRATION
Titrimetry is alive and well at LLL, 3:45110 (UCRL-80878)
ORGANIC NITROGEN COMPOUNDS
See also ACRYLONITRILE
NITRILES
NITRO COMPOUNDS
NITROSO COMPOUNDS
PROTEINS
PYRROLIDONES
ORGANIC NITROGEN COMPOUNDS/REMOVAL
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
ORGANIC OXYGEN COMPOUNDS
See also CARBOHYDRATES
EPOXIDES
KETONES
ORGANIC OXYGEN COMPOUNDS/REMOVAL
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Quarterly progress report No. 1, May 7-July 31, 1976, 3:44069 (TID-28163)
ORGANIC POLYMERS
See also PLASTICS
POLYESTERS
POLYVINYLS
RESINS
THERMOPLASTICS
Additive for petroleum distillates (Patent), 3:44191
Use of polymer solution for consolidation of coal seams, 3:44140
ORGANIC SOLVENTS/ENVIRONMENTAL IMPACTS
Control of volatile organic emissions from solvent metal cleaning, 3:45322 (PB-274557)
ORGANIC SOLVENTS/GAS CHROMATOGRAPHY
Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April-June 1977, 3:44062 (FE-2270-24)
ORGANIC SOLVENTS/HYDROGENATION
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1-May 31, 1977, 3:44067 (FE-2353-17)
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
ORGANIC SOLVENTS/MASS SPECTROSCOPY
Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April-June 1977, 3:44062 (FE-2270-24)
ORGANIC SULFUR COMPOUNDS
See also THIOCYANATES
ORGANIC SULFUR COMPOUNDS/REMOVAL
Method to desulphurize coal (Patent), 3:44032
ORGANIC WASTES/PYROLYSIS
Method and equipment for producing synthetic fuel from wastes (Patent), 3:44336
ORGANS
See also KIDNEYS
ORGANS/RADIATION DOSES
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
ORGANS/RADIONUCLIDE KINETICS
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
ORMAK DEVICES/WALL LOADING
Energy loss to the wall and limiter in normal ORMAK discharges, 3:46091
OTAKE GEOTHERMAL FIELD/GEOCHEMICAL SURVEYS
Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields, 3:44586 (CONF-7410177-3)
OTAKE GEOTHERMAL FIELD/GEOLOGY
Geochemical survey of geothermal fields: boron, arsenic, and mercury in altered clay in Otake and Hatchogbaru fields, 3:44586 (CONF-7410177-3)
OTAKE GEOTHERMAL FIELD/GEOTHERMAL POWER PLANTS
Safety measures for geothermal power generation plant without steady monitoring system, 3:44598 (NP-22300)
OXIDES/ENVIRONMENTAL TRANSPORT
Role of hydrous metal oxides in the transport of heavy metals in the environment (Fe, Mn, Cu, Zn, Ni, Cd), 3:45345
OXIRANS
See EPOXIDES
OXYGEN/CHEMICAL REACTION KINETICS
High-temperature CO_2/O_2-coal reaction rate experiments (420 to 603°C), 3:44050 (LA-7277-MS)
OXYGEN/CHEMICAL REACTIONS
Action of aqueous alkali on pyrite (Ph.D. dissertation), 3:44030 (IS-ICP-51)
OXYGEN/ION-ATOM COLLISIONS
Born cross sections for ion-atom collisions, 3:45535
OXYGEN/PRODUCTION
Thermochemical process for producing methane and oxygen (Patent), 3:44331
OXYGEN/RADIOSENSITIVITY EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (X and gamma radiation, electrons, negative pions), 3:45398 (STI/PUB-441(Vol.1))
OXYGEN/REMOVAL
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
OXYGEN 15/RADIONUCLIDE KINETICS
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
OXYGEN 16/CHARGE DENSITY
Pion-exchange contributions to charge densities of closed-shell nuclei, 3:45691

OXYGEN 16/RANGE
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
OXYGEN 16/STOPPING POWER
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
OXYGEN 16 REACTIONS/ALPHA-TRANSFER REACTIONS
Resonant effects in the reaction ^{24}Mg (^{16}O,^{12}C)^{28}Si, 3:45716
OXYGEN 16 REACTIONS/COMPOUND-NUCLEUS REACTIONS
Confirmation of 8^+ assignment to the 11.86 MeV level in ^{24}Mg, 3:45706
Population of resonant ^{12}C + ^{12}C states via the reaction ^{12}C(^{16}O, α)^{24}Mg, 3:45699
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
OXYGEN 16 REACTIONS/COULOMB SCATTERING
Coulomb-nuclear interference for high-spin states excited by ^{86}Kr, ^{40}Ar, and ^{16}O projectiles, 3:45748
OXYGEN 16 REACTIONS/ELASTIC SCATTERING
Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
OXYGEN 16 REACTIONS/FRAGMENTATION
Central collisions produced by relativistic heavy ions in nuclear emulsion, 3:45572
Fragmentation of ^{4}He, ^{12}C, ^{14}N, and ^{16}O nuclei in nuclear emulsion at 2.1 GeV/nucleon, 3:45688
OXYGEN 16 REACTIONS/FUSION REACTIONS
Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
OXYGEN 16 REACTIONS/INELASTIC SCATTERING
^{16}O + ^{40}Ca inelastic scattering and direct-reaction calculations in heavy-ion scattering, 3:45725
OXYGEN 16 REACTIONS/RESONANCE SCATTERING
Resonant effects in the reaction ^{24}Mg (^{16}O,^{12}C)^{28}Si, 3:45716
OXYGEN 16 TARGET/FUSION REACTIONS
Three-dimensional time-dependent Hartree-Fock calculations: Application to ^{16}O + ^{16}O collisions, 3:45695
OXYGEN 16 TARGET/INELASTIC SCATTERING
Three-dimensional time-dependent Hartree-Fock calculations: Application to ^{16}O + ^{16}O collisions, 3:45695
OXYGEN 16 TARGET/LITHIUM 6 REACTIONS
Alpha-cluster structure of the ^{20}Ne nucleus at excitation energies above 30 MeV, 3:45713
OXYGEN 16 TARGET/OXYGEN 16 TARGET
Three-dimensional time-dependent Hartree-Fock calculations: Application to ^{16}O + ^{16}O collisions, 3:45695
OXYGEN 16 TARGET/PION PLUS REACTIONS
Elastic scattering of positive pions on ^{16}O at 40.0 and 49.7 MeV, 3:45708
Pion double-charge exchange on ^{16}O and ^{18}O, 3:45697
Proton knockout from light nuclei by 170-MeV π^+ mesons, 3:45710
OXYGEN 17/ELECTROMAGNETIC FORM FACTORS
Core-polarization and exchange-current effects on the magnetic form factor of ^{17}O, 3:45693
OXYGEN 18/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
OXYGEN 18/ISOTOPE RATIO
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
OXYGEN 18 REACTIONS/COMPOUND-NUCLEUS REACTIONS
Mass and β decay of the new neutron-rich isotope ^{60}Mn, 3:45729
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
OXYGEN 18 REACTIONS/ELASTIC SCATTERING
Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
OXYGEN 18 REACTIONS/FUSION REACTIONS
^{18}O + ^{12}C and ^{18}O + ^{13}C fusion-evaporation reactions, 3:45703
Complete fusion of /sup 16,18/O with /sup 24,26/Mg, 3:45714
OXYGEN 18 REACTIONS/TWO-NUCLEON TRANSFER REACTIONS
Optimum Q value in heavy-ion-induced neutron transfer at the Coulomb barrier, 3:45740
OXYGEN 18 TARGET/PION PLUS REACTIONS
Pion double-charge exchange on ^{16}O and ^{18}O, 3:45697
OXYGEN EFFECT (RADIOBIOLOGY)
See OXYGEN
OXYGEN IONS/ION-ATOM COLLISIONS
Nonstatistical propulation of magnetic substates of the ($1s^{-1}2p^{-1}$) $^1P_1$ state in Al, 3:45532
Z, velocity, and charge dependence of zero-degree electron "cusps" from charge transfer to continuum states of bare and highly ionized projectiles, 3:45534
OXYMETHYLENE
See FORMALDEHYDE
OYSTERS/POLLUTION
Investigations of heavy metals and other persistent chemicals, Westernport Bay, Australia (Zn, Cu, and Cd in oysters), 3:45349
OZONE/LATITUDE EFFECT
Total ozone derived from uv spectrophotometer measurements on the NASA CV-990 aircraft for the fall 1976 latitude survey flights. Final report, 3:45479 (N-77-33684)
OZONE/MONITORING
The 1976 NRL air quality data. Final report, 3:45289 (AD-A-048750)

P

P WAVES (SEISMIC)
See SEISMIC P WAVES
PACIFIC OCEAN/TEMPERATURE DISTRIBUTION
Interannual variability of the ocean-atmosphere system, 3:45288
PACIFIC OCEAN/WIND
Interannual variability of the ocean-atmosphere system, 3:45288
PAKHRA SYNCHROTRON/VISIBLE RADIATION
Observation of undulating radiation with the "Pakhra" synchrotron, 3:45245
PALLADIUM 105 TARGET/PROTON REACTIONS
Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag, 3:45744
PALLADIUM 106 TARGET/PROTON REACTIONS
Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag, 3:45744
PALLADIUM 107/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
PALLADIUM 108/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
PALLADIUM HYDRIDES/ISOTOPE EFFECTS
Superconductivity in two-component compounds. The isotope effect in PdH, 3:45075
PALLADIUM HYDRIDES/RAMAN SPECTRA
Raman studies of hydrogen vibrational modes in palladium, 3:45118 (COO-1198-1212)
PALLADIUM HYDRIDES/TRANSITION TEMPERATURE
Superconductivity in two-component compounds. The isotope effect in PdH, 3:45075
PAPER/MATERIALS RECOVERY
Economic adjustment strategy study for San Joaquin County, California, 3:44963 (PB-274556)
PAPER INDUSTRY/CO-GENERATION
Cogeneration of steam and electric power (Book; 4 parts), 3:44870
PARABOLIC COLLECTORS/PERFORMANCE
Numerical simulation of parabolic collectors for solar heat exchangers, 3:44492 (CONF-761220-)
PARABOLIC REFLECTORS
See also COMPOUND PARABOLIC CONCENTRATORS
PARABOLIC REFLECTORS/CONFIGURATION
Solar ladder (Patent), 3:44506
PARAFFINS
See ALKANES
PARAMETRIC INSTABILITIES/REVIEWS
Parametric processes in magnetically confined CTR plasmas, 3:46011
PARAMETRIC INSTABILITIES/SOLITONS
Modulational instability and nonlinear waves in a cold plasma, 3:46026
PARTICLE INTERACTIONS
See also INCLUSIVE INTERACTIONS
NEUTRAL-CURRENT INTERACTIONS
PARTICLE INTERACTIONS/SKYRME POTENTIAL
Coordinate-space formalism of the random-phase approximation, 3:45779
PARTICLE INTERACTIONS/SPACE-TIME
Classical space-time concepts in high-energy collisions, 3:45628
PARTICLE INTERACTIONS/T INVARIANCE
Coordinate-space formalism of the random-phase approximation, 3:45779
PARTICLE SIZE/MEASURING METHODS
Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB-266103)
PARTICLE SIZE CLASSIFIERS/MEETINGS
Proceedings: seminar on in-stack particle sizing for particulate control device evaluation. Environmental Protection Technology Series, 3:45235 (PB-266103)

PARTICLE-HOLE MODEL/RANDOM PHASE APPROXIMATION
Coordinate-space formalism of the random-phase approximation, 3:45779
PARTICLES/DIFFUSION
Minimum entropy production principle and Ostwald ripening, 3:45831 (COO-4385-1)
PARTICLES/HEAT TRANSFER
Cooling of solid particles with irregularly shaped surfaces, 3:44076
PARTON MODEL/FERMI INTERACTIONS
Can the Fermi motion of partons recover canonical scaling in hadronic high-p/sub T/ processes, 3:45638
PASSIVE SOLAR HEATING SYSTEMS
Significance of hybrid solar architecture, 3:44406 (CONF-761220-)
Suntrap insolator/insulator possible application to walls and roofs of schools, 3:44405 (CONF-761220-)
PATIENTS/DIAGNOSTIC TECHNIQUES
Reconstruction tomography in diagnostic radiology and nuclear medicine (Book), 3:45382
Some performance and design characteristics of PETT III, 3:45383
PATIENTS/IMAGES
Reconstruction tomography from incomplete projections, 3:45387
PATIENTS/RADIOISOTOPE SCANNING
Circular ring transverse axial positron camera, 3:45390
Computerized emission transaxial tomography and determination of local brain function, 3:45392
PATIENTS/RADIONUCLIDE ADMINISTRATION
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
PATIENTS/RADIONUCLIDE KINETICS
Radiopharmaceuticals (Book), 3:45391
PATIENTS/SCINTISCANNING
Reconstruction tomography from incomplete projections, 3:45387
PAVEMENTS/CONSTRUCTION
Econocrete. Preprint 2845, 3:44956 (CONF-770448-3)
PCAC THEORY/ELECTRON-POSITRON INTERACTIONS
Production of four pions in e^+e^- collisions and partial conservation of axial current, 3:45606
PCAC THEORY/NEUTRINO-NUCLEON INTERACTIONS
Possible test of the PCAC hypothesis in neutrino reactions, 3:45625
PEARL SPAR
See DOLOMITE
PEAT/GASIFICATION
Experimental program for the development of peat gasification. Interim report No. 3. Coiled tube reactor experiments, 3:44045 (FE-2469-17)
PEAT/HYDROGENATION
Experimental program for the development of peat gasification. Interim report No. 3. Coiled tube reactor experiments, 3:44045 (FE-2469-17)
PEATGAS PROCESS/CHEMICAL REACTION KINETICS
Experimental program for the development of peat gasification. Interim report No. 3. Coiled tube reactor experiments, 3:44045 (FE-2469-17)
PEBBLE BED REACTORS/EXCURSIONS
Fast power excursions in pebble-bed reactors: methods and results, 3:44822
PEC BRASIMONE REACTOR/SHIELDING
Shield design and streaming calculations for the sodium cooled PEC reactor, 3:44701
PELLETS (FUEL)
See FUEL PELLETS
PENTAERYTHRITOL TETRANITRATE
See PETN
PEOPLES REPUBLIC OF CHINA
See CHINA
PEP STORAGE RINGS
(Positron-electron-proton storage ring.)
PEP STORAGE RINGS/VACUUM SYSTEMS
Glow discharge processing versus bakeout for aluminum storage ring vacuum chambers, 3:45251
PERSONNEL
See also MINERS
PERSONNEL/EMPHYSEMA
Toxicity of cadmium: mechanism and diagnosis, 3:45424
PERSONNEL/RADIATION DOSES
Report to Congress on abnormal occurrences, October-December 1977, 3:45427 (NUREG-0090-10)
PERSONNEL/UROGENITAL SYSTEM DISEASES
Toxicity of cadmium: mechanism and diagnosis, 3:45424
PERTURBATION THEORY/SERIES EXPANSION
Convergence properties of the Brillouin-Wigner type of perturbation expansion, 3:45855
PEST CONTROL
Global environment, 3:45329 (NP-23191)
PESTICIDES/BIOLOGICAL EFFECTS
Environmental quality. The sixth annual report of the Council on Environmental Quality, 3:45293 (NP-23191)
PESTICIDES/TOXICITY
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
PETN
(Pentaerythritol tetranitrate.)
PETN/TITRATION
Titrimetry is alive and well at LLL, 3:45110 (UCRL-80878)
PETROCHEMICALS
See also CHEMICAL FEEDSTOCKS
PETROCHEMICALS/PRODUCTION
Natural resources of the earth. Relations between raw materials and energy, 3:44172
PETROLEUM
See also OIL WELLS
SHALE OIL
Observations of a cold-water intertidal community after 5 years of a low-level, persistent oil spill from the General M.C. Meigs, 3:45411
PETROLEUM/BIODEGRADATION
Microbial ecology studies of the Metula spill in the Straits of Magellan, 3:45409
PETROLEUM/BIOLOGICAL ACCUMULATION
Bioavailability of crude oil from experimentally oiled sediments to English sole (Parophrys vetulus), and pathological consequences, 3:45377
PETROLEUM/BIOLOGICAL EFFECTS
Comparison of oiled and unoiled intertidal communities in Chedabucto Bay, Nova Scotia, 3:45410
Effects of chronic exposure to petroleum upon the growth and molting of juveniles of the arctic marine isopod crustacean Mesidotea entomon, 3:45415
Influence of environmental contamination on cytochrome P-450 mixed-function oxygenases in fish: implications for recovery in the Wild Harbor Marsh, 3:45419
Pathological changes in a marine fish after a 6-month exposure to petroleum, 3:45416
PETROLEUM/CHARGES
Task force on compliance and enforcement. Final report. Volume 2, 3:44186 (DOE/ERA-0006(Vol.2))
PETROLEUM/CHRONIC INTAKE
Recovery of benthic macrofauna from chronic pollution in the sea area off a refinery plant, southwest Finland, 3:45418
PETROLEUM/DESULFURIZATION
Method to desulphurize crude petroleums, heavy fuel oils and similar heavy oils (Patent), 3:44168
PETROLEUM/ENHANCED RECOVERY
DEEP STEAM: Project 16 enhanced oil recovery. Quarterly report, October 1-December 31, 1977, 3:44153 (SAND-78-0313)
Fossil Energy Development Programs. Quarterly report, October 1-December 31, 1977, 3:44052 (SAND-78-0653)
Oil recovery by carbon dioxide injection. Quarterly report, October-December 1976, 3:44151 (ORO-5301-7)
PETROLEUM/ENVIRONMENTAL EFFECTS
Global environment, 3:45329 (NP-23191)
PETROLEUM/ENVIRONMENTAL TRANSPORT
Fate and effects of oil pollutants in extremely cold marine environments. Annual report No. 5, 1 January-31 December 1977, 3:45326 (AD-A-048334)
PETROLEUM/PRODUCTION
Environmental Development Plan (EDP). Oil supply. FY 1977, 3:44185 (DOE/EDP-0024)
Oil and Gas Compact Bulletin. Volume 36, Number 1, July 1977, 3:44150 (CONF-770757-)
PETROLEUM/TRANSPORT
Alaska oil starts flowing (Pipelines), 3:44188
High-value energy needs more efficient conversion, transport, 3:44128
PETROLEUM/WEATHERING
Importance of sediment working by the deposit-feeding polychaete Arenicola marina on the weathering rate of sediment-bound oil, 3:45413
PETROLEUM DEPOSITS/EXPLORATION
Marine approaches to U.S. ports: a flexible and obstruction-free system is needed (Shipping routes vs offshore exploration), 3:44883 (CED-78-107)
PETROLEUM DEPOSITS/ORIGIN
Experimental diagenetic study of a modern lipid-rich sediment, 3:44146
Geological conditions of petroleum formation and accumulations on ancient platforms, 3:44148
PETROLEUM DISTILLATES/ADDITIVES
Additive for petroleum distillates (Patent), 3:44191

PETROLEUM DISTILLATES/CRACKING
Method for the catalytic cracking of two hydrocarbon fractions and equipment to carry it out (Patent), 3:44166
PETROLEUM INDUSTRY/ENVIRONMENTAL EFFECTS
Environmental Development Plan (EDP). Oil supply. FY 1977, 3:44185 (DOE/EDP-0024)
PETROLEUM INDUSTRY/GOVERNMENT POLICIES
Task force on compliance and enforcement. Final report. Volume 2, 3:44186 (DOE/ERA-0006(Vol.2))
PETROLEUM INDUSTRY/LEGAL ASPECTS
Jurisdiction and mining administration. Immediate enforcebility of an approved operation plan (German Federal Republic), 3:44187
PETROLEUM INDUSTRY/PRODUCTION
Oil industry in Austria during 1976, 3:44174
PETROLEUM REFINERIES
Recovery of benthic macrofauna from chronic pollution in the sea area off a refinery plant, southwest Finland, 3:45418
PETROLEUM REFINERIES/CO-GENERATION
Cogeneration of steam and electric power (Book; 4 parts), 3:44870
PETROLEUM RESIDUES/COKING
Research and development as an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. Quarterly report, September-November 1977 (Tracer studies), 3:44060 (FE-1800-21)
PETTEN HIGH FLUX REACTOR
See HFR REACTOR
PHANTOMS/ELECTRON DOSIMETRY
Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr-77-72)
PHANTOMS/GAMMA DOSIMETRY
Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr-77-72)
PHANTOMS/PION DOSIMETRY
Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr-77-72)
PHARMACEUTICALS
See DRUGS
PHENIX REACTOR/REACTOR OPERATION
One year of Phenix operation, 3:44708 (BNWL-tr-317)
PHENYLETHYLENE
See STYRENE
PHIPPS BEND-1 REACTOR/SOCIO-ECONOMIC FACTORS
Phipps Bend Nuclear Energy Project. Community impact assessment. Final report, 3:44645 (PB-274370)
PHIPPS BEND-2 REACTOR/SOCIO-ECONOMIC FACTORS
Phipps Bend Nuclear Energy Project. Community impact assessment. Final report, 3:44645 (PB-274370)
PHOSPHATES/BIOLOGICAL REGENERATION
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)
PHOSPHORUS 31/RANGE
Ranges of projectiles with $8 <$ or $= Z <$ or $= 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
PHOSPHORUS 31/STOPPING POWER
Ranges of projectiles with $8 <$ or $= Z <$ or $= 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
PHOSPHORUS 31 TARGET/PHOTONUCLEAR REACTIONS
Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV, 3:45563
PHOTOCHEMICAL OXIDANTS/CHEMICAL REACTION KINETICS
Measurement of rate constants of importance in smog. Final report, April 1973-July 1977, 3:45298 (PB-274530)
PHOTODISINTEGRATION
See PHOTONUCLEAR REACTIONS
PHOTOELECTROLYTIC CELLS/ELECTRODES
Evaluation of the commercial feasibility of hydrogen production by the solar photoelectrolysis of water. Task I interim report, 3:44390 (TID-27802)
PHOTOELECTROLYTIC CELLS/ELECTROLYTES
Evaluation of the commercial feasibility of hydrogen production by the solar photoelectrolysis of water. Task I interim report, 3:44390 (TID-27802)
PHOTOELECTROLYTIC CELLS/FEASIBILITY STUDIES
Evaluation of the commercial feasibility of hydrogen production by the solar photoelectrolysis of water. Task I interim report, 3:44390 (TID-27802)
PHOTOELECTRON SPECTROSCOPY/LIGHT SOURCES
Description of a polarized source of He I radiation for surface studies, 3:45271
PHOTOGRAPHS
See IMAGES
PHOTOMULTIPLIERS/WINDOWS
Optical properties of the entrance windows of photomultipliers, 3:45258
PHOTON TRANSMISSION SCANNING
See also CAT SCANNING
PHOTON TRANSMISSION SCANNING/COMPARATIVE EVALUATIONS
Some performance and design characteristics of PETT III, 3:45383
PHOTON TRANSMISSION SCANNING/DATA ANALYSIS
Noninvasive brain imaging: computed tomography and radionuclides (Book), 3:45384
PHOTON TRANSPORT
(For diffusion or transmission of energetic photons in material media.)
PHOTON TRANSPORT/MULTIGROUP THEORY
Partial-range expansion for multigroup Monte Carlo photon transport, 3:45814
PHOTON-NEUTRON INTERACTIONS/PHOTOPRODUCTION
Multiple analysis of single-pion photoproduction in the region of the P_33 resonance, 3:45607
PHOTON-NUCLEON INTERACTIONS
See also PHOTON-NEUTRON INTERACTIONS
PHOTON-PROTON INTERACTIONS
PHOTOPRODUCTION
PHOTON-NUCLEON INTERACTIONS/TOTAL CROSS SECTIONS
Semiclassical sum rules, 3:45600
PHOTON-PROTON INTERACTIONS/PHOTOPRODUCTION
Multiple analysis of single-pion photoproduction in the region of the P_33 resonance, 3:45607
PHOTON-PROTON INTERACTIONS/TOTAL CROSS SECTIONS
Measurements of the photon total cross section on protons from 18 to 185 GeV, 3:45560
PHOTONUCLEAR REACTIONS/GIANT RESONANCE
Photoneutron reactions near threshold and the optical model of nuclei, 3:45805
PHOTONUCLEAR REACTIONS/NUCLEAR REACTION YIELD
Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV, 3:45563
PHOTOPRODUCTION
See also PHOTON-NUCLEON INTERACTIONS
PHOTOPRODUCTION/FORM FACTORS
Electroproduction of low hadronic masses, 3:45598
PHOTOSPHERE/MAGNETIC FIELDS
Rope structure of a magnetic field rising to the solar surface, 3:45458
Sources of magnetic fields in recurrent interplanetary streams, 3:45478 (N-77-34091)
PHYSICAL PROTECTION DEVICES/ON-LINE SYSTEMS
Description, operation, and diagnostic routines for the adaptive intrusion data system, 3:44310 (SAND-77-1029)
PHYTOPLANKTON/METABOLISM
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)
PICEANCE CREEK BASIN/NATURAL GAS WELLS
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
PICKERING-1 REACTOR/FUEL MANAGEMENT
Nuclear reactor fuel management, 3:44682
PICKERING-1 REACTOR/REACTOR COOLING SYSTEMS
Contribution of fission products to radiation fields in a pressurized heavy water reactor, 3:44683
PICKERING-2 REACTOR/REACTOR COOLING SYSTEMS
Contribution of fission products to radiation fields in a pressurized heavy water reactor, 3:44683
PICKERING-3 REACTOR/PRESSURE TUBES
Delayed hydrogen cracking of zirconium alloy pressure tubes, 3:44678 (CONF-760688-)
PICKERING-3 REACTOR/REACTOR COOLING SYSTEMS
Contribution of fission products to radiation fields in a pressurized heavy water reactor, 3:44683
PICKERING-4 REACTOR/PRESSURE TUBES
Delayed hydrogen cracking of zirconium alloy pressure tubes, 3:44678 (CONF-760688-)
PICKERING-4 REACTOR/REACTOR COOLING SYSTEMS
Contribution of fission products to radiation fields in a pressurized heavy water reactor, 3:44683
PICKERING-5 REACTOR/DESIGN
Influence of design and regulatory code changes on a 'repeat' project - Pickering G.S. 'B', 3:44679 (CONF-760688-)
PICKERING-6 REACTOR/DESIGN
Influence of design and regulatory code changes on a 'repeat' project - Pickering G.S. 'B', 3:44679 (CONF-760688-)

PICKERING-7 REACTOR/DESIGN
Influence of design and regulatory code changes on a 'repeat' project - Pickering G.S. 'B', 3:44679 (CONF-760688-)
PICKERING-8 REACTOR/DESIGN
Influence of design and regulatory code changes on a 'repeat' project - Pickering G.S. 'B', 3:44679 (CONF-760688-)
PILES
See FOUNDATIONS
PINS (FUEL)
See FUEL PINS
PION BEAMS/MICRODOSIMETRY
Investigation of the microdosimetric characteristics of broad, therapeutic beams of negative pions at LAMPF, 3:45396 (LA-UR-78-1205)
PION BEAMS/RADIATION QUALITY
Investigation of the microdosimetric characteristics of broad, therapeutic beams of negative pions at LAMPF, 3:45396 (LA-UR-78-1205)
PION CONDENSATION/REVIEWS
Vacuum polarization in strong fields and pion condensation, 3:45789
PION DOSIMETRY/EXPERIMENT PLANNING
Proposal for an experimental program on SIN: comparative dosimetry on tissue-equivalent phantoms with negative pions, fast electrons, and cobalt-60-gamma rays, 3:45830 (LA-tr-77-72)
PION MINUS REACTIONS/CAPTURE
Effective Hamiltonian for radiative capture of pions by complex nuclei, 3:45801
PION MINUS REACTIONS/ELASTIC SCATTERING
Elastic scattering of 162-MeV pions by nuclei, 3:45700
PION MINUS REACTIONS/INCLUSIVE INTERACTIONS
Production of J/Psi particles by 43-GeV/c π^- mesons on the nuclei Be, Cu, and W, 3:45586
Semi-inclusive π^- N reactions at 40 GeV/c, 3:45591
PION MINUS-NEUTRON INTERACTIONS/ANGULAR CORRELATION
Two-particle correlations of charged particles and photons in pion-nucleon interactions at 40 GeV/c, 3:45589
PION MINUS-NEUTRON INTERACTIONS/INCLUSIVE INTERACTIONS
Semi-inclusive π^- N reactions at 40 GeV/c, 3:45591
PION MINUS-PROTON INTERACTIONS/DIFFERENTIAL CROSS SECTIONS
Study of the invariant structure function of the reaction $\pi^- p \rightarrow \gamma^+ xxx$ at 5 GeV/c, 3:45587
PION MINUS-PROTON INTERACTIONS/DIFFRACTION MODELS
Hybrid-bubble-chamber study of nucleon diffractive dissociation in 14-GeV/c π^{+-} p collisions, 3:45585
PION MINUS-PROTON INTERACTIONS/ELASTIC SCATTERING
Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581
PION MINUS-PROTON INTERACTIONS/INCLUSIVE INTERACTIONS
Semi-inclusive π^- N reactions at 40 GeV/c, 3:45591
PION MINUS-PROTON INTERACTIONS/INELASTIC SCATTERING
Hybrid-bubble-chamber study of nucleon diffractive dissociation in 14-GeV/c π^{+-} p collisions, 3:45585
PION MINUS-PROTON INTERACTIONS/PAIR PRODUCTION
Model-independent analysis of the inverse electroproduction of pions at 276 MeV, 3:45696
PION MINUS-PROTON INTERACTIONS/PARTICLE PRODUCTION
Cross sections of strange particle production in π^- p interactions at 5 GeV/c, 3:45590
Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581
PION MINUS-PROTON INTERACTIONS/TRANSVERSE MOMENTUM
Transverse momentum correlations of identical pions from 40-GeV/c π^- p interactions, 3:45588
PION PLUS REACTIONS/CHARGE-EXCHANGE REACTIONS
Pion double-charge exchange on ^{16}O and ^{18}O, 3:45697
PION PLUS REACTIONS/ELASTIC SCATTERING
Elastic scattering of positive pions on ^{16}O at 40.0 and 49.7 MeV, 3:45708
Elastic scattering of 162-MeV pions by nuclei, 3:45700
PION PLUS REACTIONS/KNOCK-OUT REACTIONS
Proton knockout from light nuclei by 170-MeV π^+ mesons, 3:45710
PION PLUS-PROTON INTERACTIONS/DIFFRACTION MODELS
Hybrid-bubble-chamber study of nucleon diffractive dissociation in 14-GeV/c π^{+-} p collisions, 3:45585
PION PLUS-PROTON INTERACTIONS/INELASTIC SCATTERING
Hybrid-bubble-chamber study of nucleon diffractive dissociation in 14-GeV/c π^{+-} p collisions, 3:45585
PION REACTIONS/DIFFERENTIAL CROSS SECTIONS
$\pi^+ + d \rightarrow p + p$ reaction at 40, 50, and 60 MeV, 3:45689
PION REACTIONS/NUCLEAR CASCADES
High energy ($E <$ or $=$ 1000 GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data, 3:45641
PION REACTIONS/TOTAL CROSS SECTIONS
High energy ($E <$ or $=$ 1000 GeV) intranuclear cascade model for nucleons and pions incident on nuclei and comparisons with experimental data, 3:45641
PION-NUCLEON INTERACTIONS/K MATRIX
K-matrix fits to $\pi N \rightarrow N\pi$ and $\pi N \rightarrow N\pi\pi$ in the resonance region $\sqrt{s} = 1.3$ to 2.0 GeV, 3:45634
PION-NUCLEON INTERACTIONS/SCATTERING AMPLITUDES
K-matrix fits to $\pi N \rightarrow N\pi$ and $\pi N \rightarrow N\pi\pi$ in the resonance region $\sqrt{s} = 1.3$ to 2.0 GeV, 3:45634
Theory of the low-energy pion-nucleon interaction, 3:45797
PION-PION INTERACTIONS/SCATTERING AMPLITUDES
Adler zero and the dual multiperipheral model, 3:45631
PIONS
See also PIONS MINUS
PIONS NEUTRAL
PIONS PLUS
PIONS/BIOLOGICAL RADIATION EFFECTS
Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr-77-73B)
PIONS/ELECTROPRODUCTION
Electroproduction of single pions at low ϵ and a measurement of the pion form factor up to $Q^2 = 10$ GeV^2, 3:45562
PIONS/FORM FACTORS
Electroproduction of single pions at low ϵ and a measurement of the pion form factor up to $Q^2 = 10$ GeV^2, 3:45562
PIONS/PARTICLE PRODUCTION
Can existing high-transverse-momentum hadron experiments be interpreted by contemporary quantum chromodynamics ideas, 3:45639
PIONS MINUS
Investigation of the microdosimetric characteristics of broad, therapeutic beams of negative pions at LAMPF, 3:45396 (LA-UR-78-1205)
PIONS MINUS/PARTICLE PRODUCTION
Inclusive pion production in relativistic proton collisions with nuclei, a reexamination, 3:45637
Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581
PIONS MINUS/PHOTOPRODUCTION
Multiple analysis of single-pion photoproduction in the region of the P_{33} resonance, 3:45607
PIONS MINUS/RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
PIONS NEUTRAL/PAIR PRODUCTION
Azimuthal correlations of high-transverse-momentum π^0 pairs, 3:45559
PIONS NEUTRAL/PHOTOPRODUCTION
Multiple analysis of single-pion photoproduction in the region of the P_{33} resonance, 3:45607
PIONS PLUS/DECAY
Weak-interaction-induced neutrino oscillations, 3:45619
PIONS PLUS/PARTICLE PRODUCTION
Inclusive pion production in relativistic proton collisions with nuclei, a reexamination, 3:45637
PIONS PLUS/PHOTOPRODUCTION
Multiple analysis of single-pion photoproduction in the region of the P_{33} resonance, 3:45607
PIPE FITTINGS/STRESS ANALYSIS
End effects on elbows subjected to moment loadings, 3:44760 (ORNL/Sub-2913/7)
PIPELINES
See also ALASKA OIL PIPELINE
PIPELINES/LEAK TESTING
Acoustic leakage detection in pipelines, 3:44189 (ANL-Trans-1131)
PIPELINES/REGULATIONS
Experience gained with the regulation on HP gas pipelines, issued on December 17, 1974 (German Federal Republic), 3:44197
PIPELINES/SAFETY
Pipeline safety: need for a stronger Federal effort, 3:45155 (CED-78-99)

PIPES/RATCHETING
Thermal ratchetting tests of Type 304 stainless steel pipe: specimens TTT-1 and TTT-2, 3:45013 (ORNL-5386)
PLANKTON
See also PHYTOPLANKTON
ZOOPLANKTON
PLANKTON/CHEMICAL ANALYSIS
Mercury distribution in the Chesapeake Bay, 3:45350
PLANKTON/POLLUTION
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
PLANT CELLS/DNA REPLICATION
18 μm replication units of chromosomal DNA fibers of differentiated cells of pea (Pisum sativum), 3:45372
PLANTS
See also AQUATIC ORGANISMS
BIOMASS
PLANTS/POLLUTION
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
PLANTS (INDUSTRIAL)
See INDUSTRIAL PLANTS
PLANTS (POWER)
See POWER PLANTS
PLASMA
See also BEAM-PLASMA SYSTEMS
COLD PLASMA
COLLISIONAL PLASMA
COLLISIONLESS PLASMA
HIGH-BETA PLASMA
HOMOGENEOUS PLASMA
HOT PLASMA
INHOMOGENEOUS PLASMA
LASER-PRODUCED PLASMA
QUIESCENT PLASMA
Preliminary study on plasma physics and its applications, 3:45952 (PPGM-R95-76)
PLASMA/BETA RATIO
Expression for β in linked min-B configurations, 3:45961
PLASMA/BREMSSTRAHLUNG
Bremsstrahlung of relativistic electrons in a plasma in a strong magnetic field, 3:46079
PLASMA/CHARGE EXCHANGE
Charge exchange in plasmas, 3:45978
PLASMA/CHARGED-PARTICLE TRANSPORT
Plasma transport across a braided magnetic field, 3:45962
PLASMA/CYCLOTRON RADIATION
Absorption coefficient of a magnetized plasma for cyclotron radiation, 3:46051
PLASMA/DIFFUSION
Pfirsch-Schlueter impurity diffusion, 3:45966
Turbulent diffusion in a multicomponent plasma, 3:45976
PLASMA/ELECTRIC CONDUCTIVITY
Theoretical studies of MHD plasma molecules. I. Potential energy curves and dipole moments of linear KOH, 3:45870
PLASMA/ELECTROMAGNETIC RADIATION
Filamentation of lower-hybrid cones, 3:46050
Nonlinear transmission and reflection of electromagnetic waves of identical polarization which are incident obliquely on a plasma slab, 3:46071
Nonlinear transmission and reflection of electromagnetic waves obliquely incident on a plasma slab. II. Waves of different polarization, 3:46064
Nonlinear reflection of an intense electromagnetic wave from a dense plasma slab, 3:46065
PLASMA/ELECTRON BEAM INJECTION
Charge and current neutralization in the injection of an electron beam into a bounded waveguide containing a magnetized plasma, 3:45969
Injection of a relativistic electron beam into a bounded plasma in a magnetic field, 3:45968
PLASMA/ELECTRON COLLISIONS
Charge exchange in plasmas, 3:45978
PLASMA/IMPURITIES
Pfirsch-Schlueter impurity diffusion, 3:45966
PLASMA/KINETIC EQUATIONS
Theory of two-fluid equilibrium of an axially symmetric plasma, 3:45951 (N-77-33997)
PLASMA/MICROWAVE RADIATION
Ion wave excitation by radiation pressure in a plasma waveguide, 3:46053
PLASMA/NEUTRAL ATOM BEAM INJECTION
Effect of neutral injection on particle diffusion and heat transfer under neoclassical conditions, 3:45971
PLASMA/RADIATIVE COOLING
Steady-state radiative cooling rates for low-density, high-temperature plasmas, 3:45965
PLASMA/RELATIVISTIC BEAM INJECTION
Charge and current neutralization in the injection of an electron beam into a bounded waveguide containing a magnetized plasma, 3:45969
Injection of a relativistic electron beam into a bounded plasma in a magnetic field, 3:45968
PLASMA/REVIEWS
Waves and instabilities in plasmas. Report on the fusion aspects of the third international congress, Palaiseau, France, 27 June - 1 July 1977, 3:45931
PLASMA/TURBULENCE
Irreversibility of electrostatic plasma turbulence, 3:45979
Turbulent diffusion in a multicomponent plasma, 3:45976
PLASMA ACCELERATION/MICROWAVE RADIATION
Plasma acceleration by means of microwave radiation pressure, 3:45944
PLASMA ARC WELDING/EVALUATION
Evaluation of plasma arc welding capabilities and applications, 3:45134 (RFP-2722)
PLASMA BETATRONS/PERFORMANCE
Collective ion acceleration through temporal modulation of relativistic-electron-beam energy, 3:45871
PLASMA DIAGNOSTICS
Diagnostic planning in JT-60 project, 3:45902 (JAERI-M-7220)
PLASMA DIAGNOSTICS/ABSORPTIVITY
Method for determining plasma properties from light absorption, 3:45922
PLASMA DIAGNOSTICS/ELECTROSTATIC PROBES
Electrostatic-probe diagnostics of a weakly ionized plasma in a magnetic field. II, 3:45921
Measurement of the properties of a weakly ionized plasma with an electrostatic probe in a magnetic field. I. Charged-particle density, 3:45920
Plasma space potential, 3:45925
Probe diagnostics of a low-temperature plasma in a magnetic field. I. Experimental procedure and determination of the plasma density, 3:45926
Probe diagnostics of a low-temperature plasma in a magnetic field. II. Determination of the electron temperature and the plasma potential, 3:45927
PLASMA DIAGNOSTICS/FLUORESCENCE
Use of the method of resonance fluorescence with a dye laser for plasma diagnostics in the FT-1 tokamak installation, 3:45917
PLASMA DIAGNOSTICS/HARMONICS
Generation of harmonics of the pump wave and diagnostic of parametric turbulence, 3:46017
PLASMA DIAGNOSTICS/INTERFEROMETERS
FIR-interferometer for JT-60, 3:45901 (JAERI-M-7121)
PLASMA DIAGNOSTICS/INTERFEROMETRY
CO_2 laser-plasma interaction studies at NRC-Canada, 3:45930
Dual laser interferometer for plasma density measurements on large tokamaks, 3:45910
PLASMA DIAGNOSTICS/LANGMUIR PROBE
Probe diagnostics of a low-temperature plasma in a magnetic field. I. Experimental procedure and determination of the plasma density, 3:45926
PLASMA DIAGNOSTICS/LASER FUSION REACTORS
Imaging characteristics of an axisymmetric, grazing incidence x-ray microscope designed for laser fusion research, 3:45253
PLASMA DIAGNOSTICS/LASER RADIATION
CO_2 laser-plasma interaction studies at NRC-Canada, 3:45930
Photographic study of rapid events by picosecond techniques, 3:45904 (N-77-33495)
PLASMA DIAGNOSTICS/OPTICAL EQUIPMENT
Cornell Thomson scattering system, 3:45913
PLASMA DIAGNOSTICS/PARAMETRIC INSTABILITIES
Plasma diagnostic by the "two-beam" method, 3:45924
PLASMA DIAGNOSTICS/RF SYSTEMS
Energetic ion mass analysis using a radio-frequency quadrupole filter, 3:45912
PLASMA DIAGNOSTICS/RUNAWAY ELECTRONS
Diagnostics of beams of accelerated (runaway) electrons in tokamaks, 3:45923
PLASMA DIAGNOSTICS/SCHLIEREN METHOD
Photographic study of rapid events by picosecond techniques, 3:45904 (N-77-33495)
PLASMA DIAGNOSTICS/SCHOTTKY BARRIER DIODES
Far-ir heterodyne radiometric measurements with quasioptical Schottky diode mixers, 3:45907
PLASMA DIAGNOSTICS/THOMSON SCATTERING
Cornell Thomson scattering system, 3:45913
PLASMA DIAGNOSTICS/TIME RESOLUTION
Ultrahigh speed diagnostics of the parameters of laser plasma corona, 3:45918

PLASMA DIAGNOSTICS/X-RAY SPECTRA
CO_2 laser-plasma interaction studies at NRC-Canada, 3:45930
Experimental device for the X-ray energetic distribution measurement in a tokamak plasma, 3:45903 (JEN-390)
Observation of x-ray spectra of chromium and iron in the plasma of the "tokamak-10", 3:45916
Time evolution of the electron temperature in a laser-produced carbon plasma, 3:45915
PLASMA DRIFT/KINETIC EQUATIONS
Diffusion of a multi-ion species plasma due to drift wave fluctuations, 3:45946 (N-77-33984)
PLASMA DRIFT/NONLINEAR PROBLEMS
Scattering of drift waves by parametric interaction, 3:46042
PLASMA DRIFT/QUASILINEAR PROBLEMS
Real-space quasilinear theory of drift in a sheared magnetic field, 3:45949 (N-77-33994)
PLASMA DRIFT/THERMAL CONDUCTIVITY
Effects of nuclear fusion on reaction on diffusion and thermal conduction in a magnetoplasma, 3:45947 (N-77-33986)
PLASMA DRIFT/TRAPPING
Trapping and detrapping in a single wave and particle acceleration in a magnetoplasma, 3:46036 (N-77-33980)
PLASMA DRIFT/VARIATIONAL METHODS
Variational theory of drift and tearing eigenmodes in slab geometry, 3:45997
PLASMA EXPANSION/ENERGY BALANCE
Optimum parameters of a dense freely expanding deuterium-tritium plasma, 3:45972
PLASMA FOCUS/ELECTRIC POTENTIAL
Focusing resonance cones, 3:45868
PLASMA FOCUS/SHOCK WAVES
Formation of plane shock wave in the plasma focus zone of a magnetoplasma compressor, 3:45984
PLASMA FOCUS/THERMONUCLEAR REACTIONS
Simple model for the evolution of the plasma focus, 3:45973
PLASMA FOCUS DEVICES/FUSION YIELD
Neutron yield enhancement in a CO_2 laser irradiated plasma focus, 3:45932
PLASMA FOCUS DEVICES/LASER-RADIATION HEATING
Neutron yield enhancement in a CO_2 laser irradiated plasma focus, 3:45932
PLASMA FOCUS DEVICES/SOFT X RADIATION
Collimated soft X-rays from the plasma focus, 3:45936
PLASMA FOCUS DEVICES/X-RAY EMISSION ANALYSIS
Instability enhanced emissions of x-ray and neutron in plasma focus, 3:45941
PLASMA GUNS/ELECTRODES
Coaxial accelerator for dense plasmas, 3:45986
PLASMA GUNS/PLASMA WAVES
High-frequency plasma waves in a Hall accelerator with an extended acceleration zone, 3:46073
PLASMA HEATING
See also BEAM INJECTION HEATING
LASER-RADIATION HEATING
SHOCK HEATING
TURBULENT HEATING
PLASMA HEATING/HYBRID RESONANCE
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system, 3:45875 (N-77-34004)
PLASMA HEATING/IMPLOSIONS
Calculations of the effects of incomplete preionization in high voltage theta pinches, 3:45879
PLASMA HEATING/LASER-RADIATION HEATING
Axial laser heating of small-diameter theta-pinch plasmas, 3:45876
PLASMA INSTABILITY
See also ABSOLUTE INSTABILITIES
EXPLOSIVE INSTABILITY
PARAMETRIC INSTABILITIES
PLASMA MACROINSTABILITIES
PLASMA MICROINSTABILITIES
TRAPPED-PARTICLE INSTABILITY
TWO-STREAM INSTABILITY
PLASMA INSTABILITY/ANISOTROPY
Theory of electromagnetic instabilities in an inhomogeneous plasma stream with an anisotropic pressure, 3:46023
PLASMA INSTABILITY/ELECTRIC CURRENTS
Development of ionization instability in plasma with a variable direction of the mean current, 3:46021
PLASMA INSTABILITY/ION ACOUSTIC WAVES
Nonlinear development of the current-driven ion wave instability, 3:46031
PLASMA INSTABILITY/MICROWAVE RADIATION
Nonlinear development of the negative-mass instability and its effect on intense microwave generation, 3:45996
PLASMA INSTABILITY/NONLINEAR PROBLEMS
Nonlinear development of the current-driven ion wave instability, 3:46031
PLASMA MACROINSTABILITIES
See also FLUTE INSTABILITY
KINK INSTABILITY
TRAPPED-PARTICLE INSTABILITY
Hydromagnetic stability of tokamaks, 3:46012
Theory of hydromagnetic stability of a tokamak plasma, 3:46013
PLASMA MICROINSTABILITIES
See also BUMP-IN-TAIL INSTABILITY
DRIFT INSTABILITY
TWO-STREAM INSTABILITY
Microinstabilities in a plasma slab with steep density gradient, 3:45991 (N-77-34002)
PLASMA MICROINSTABILITIES/DISTRIBUTION FUNCTIONS
Slope reversal of a monotonically decreasing electron tail in a strong magnetic field, 3:46004
PLASMA MICROINSTABILITIES/MEAN FREE PATH
Heat flux reduction by electromagnetic instabilities, 3:46002
PLASMA PRODUCTION/MAGNETOPLASMA COMPRESSORS
Formation of plane shock wave in the plasma focus zone of a magnetoplasma compressor, 3:45984
PLASMA PRODUCTION/PROTON BEAMS
Electron density and electron temperature in a neon plasma generated by 20-MeV protons, 3:45982
PLASMA PRODUCTION/ROTATION
Beam-plasma discharge in crossed electric and magnetic fields, 3:45983
PLASMA PRODUCTION/SHOCK WAVES
Studies of laser-driven shock waves in aluminum, 3:45981
PLASMA SHEATH/DRIFT INSTABILITY
Particle simulation studies of the lower hybrid drift instability, 3:46005
PLASMA SHEATH/FLUTE INSTABILITY
Particle simulation studies of the lower hybrid drift instability, 3:46005
PLASMA SHEET/ENERGY SPECTRA
Measurements of the ion energy spectrum in a collisionless neutral current sheet, 3:45942
PLASMA WAVES
See also ION ACOUSTIC WAVES
PLASMA WAVES/CAVITATION
Numerical investigation of the collapse of Langmuir waves in a magnetic field, 3:46069
PLASMA WAVES/CHARGE DENSITY
Electron density balance and stabilization of wave profile, 3:46056
PLASMA WAVES/COMPTON EFFECT
Non-linear scattering probability of longitudinal plasma waves in a magnetoactive plasma system, 3:46055
PLASMA WAVES/EXCITATION
Experimental study of excitation of low frequency plasma waves by amplitude-modulated microwave, 3:46076
PLASMA WAVES/EXPLOSIVE INSTABILITY
Theory for space-time evolution of explosive-type instability, 3:45989 (N-77-33991)
PLASMA WAVES/HARMONICS
Generation of harmonics of the pump wave and diagnostic of parametric turbulence, 3:46017
Higher-harmonic generation in a plasma excited at the lower hybrid frequency, 3:46057
PLASMA WAVES/INTERACTIONS
Anomalous effect of small collisions on the nonlinear interaction in a small cold beam and a warm plasma system, 3:46040 (N-77-34003)
Interaction of lower hybrid waves with turbulent tokamak plasma, 3:46047
PLASMA WAVES/LANDAU DAMPING
Absorption of the lower-hybrid wave in a bounded plasma, 3:46075
PLASMA WAVES/MODULATION
Experimental study on self-modulation of ion plasma oscillations, 3:45551 (N-77-33995)
PLASMA WAVES/NONLINEAR PROBLEMS
Non-linear scattering probability of longitudinal plasma waves in a magnetoactive plasma system, 3:46055
PLASMA WAVES/PARAMETRIC INSTABILITIES
Generation of harmonics of the pump wave and diagnostic of parametric turbulence, 3:46017
PLASMA WAVES/SCATTERING
Absorption of the lower-hybrid wave in a bounded plasma, 3:46075
PLASMA WAVES/SIMULATION
Particle simulation on the propagation and plasma heating of the lower hybrid wave in the nonuniform system, 3:45875 (N-77-34004)

PLASMA WAVES/TRAPPED-PARTICLE INSTABILITY
Theory of electron trapping by plasma waves, 3:46024
PLASMA WAVES/TURBULENCE
Stationary spectra of high-frequency oscillations of a plasma in a magnetic field, 3:46077
PLASMA WAVES/WAVE PROPAGATION
Nonlinear propagation of the ordinary mode in a hot magnetoplasma, 3:46037 (N-77-33982)
Nonlinear distortion of propagation cones of lower hybrid wave in an inhomogeneous plasma, 3:46033 (IPPJ-268)
PLASTICS
See also CONCRETE-PLASTIC COMPOSITES
ORGANIC POLYMERS
POLYETHYLENES
POLYSTYRENE
THERMOPLASTICS
PLASTICS/PRODUCTION
Natural resources of the earth. Relations between raw materials and energy, 3:44172
PLATES
(Thicker than SHEETS or FOILS.)
PLATES/IMPACT SHOCK
Suggested technique for determining in-material longitudinal and shear particle velocity histories in a single-inclined-plate impact experiment, 3:45137
PLATINUM/CATALYTIC EFFECTS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
PLATINUM/FERMI LEVEL
Fermi surface of platinum, 3:45029
PLATINUM 192/EXCITED STATES
^{192}Pt(α,α′) reaction at E = 24 MeV, 3:45755
PLATINUM 192 TARGET/ALPHA REACTIONS
^{192}Pt(α,α′) reaction at E = 24 MeV, 3:45755
PLATINUM 196 TARGET/DEUTERON REACTIONS
States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
PLATINUM 196 TARGET/**NEUTRON REACTIONS**
States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
PLATINUM 197/NUCLEAR STRUCTURE
States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
PLATINUM 198 TARGET/DEUTERON REACTIONS
States in ^{197}Pt populated by the (d,p), (d,t) and (n,γ) reactions, 3:45753
PLATINUM 199/ENERGY LEVELS
Nuclear Data Sheets for A=199, 3:45756
PLATINUM 199/**NUCLEAR STRUCTURE**
Nuclear Data Sheets for A=199, 3:45756
PLATINUM BASE ALLOYS/PHYSICAL RADIATION EFFECTS
Direct observation of the point-defect structure of depleted-zones in ion-irradiated metals, 3:45055 (COO-3158-62)
PLT REACTORS/DRIFT INSTABILITY
Low-frequency microinstabilities in the PLT tokamak, 3:45884
PLT REACTORS/EMISSION SPECTRA
Rapid scanning of spatial distribution of spectral line intensities in PLT tokamak, 3:45935 (PPPL-1430)
PLT REACTORS/IMPURITIES
Lower limits for parallel impurity fluxes in the PLT edge plasma, 3:45905 (PPPL-1440)
Rapid scanning of spatial distribution of spectral line intensities in PLT tokamak, 3:45935 (PPPL-1430)
PLT REACTORS/MICROWAVE RADIATION
Low-frequency microinstabilities in the PLT tokamak, 3:45884
PLT REACTORS/TURBULENCE
Low-frequency microinstabilities in the PLT tokamak, 3:45884
PLT REACTORS/VACUUM SYSTEMS
Turbomolecular pump vacuum system for the Princeton Large Torus, 3:45226
PLUMES/ENVIRONMENTAL EFFECTS
Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes, 3:45360 (ANL/WR-77-3)
PLUMES/SAMPLING
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP-1469)
PLUTONIUM/BREEDING
Basic requirements of laser fusion power production and laser fusion-fission plutonium breeding, 3:46105
PLUTONIUM/CALORIMETRY
Electric heat balance calorimeter. Final report (For assay of plutonium-bearing samples), 3:45268 (NUREG/CR-0054)
PLUTONIUM/CRITICALITY
Handbook of critical experiments benchmarks, 3:45150 (PNL-2700)
PLUTONIUM/INHALATION
Status of plutonium assessment in lung, 3:45403 (ORNL-tr-4619)
PLUTONIUM/MAXIMUM PERMISSIBLE INTAKE
Status of plutonium assessment in lung, 3:45403 (ORNL-tr-4619)
PLUTONIUM/MUONIC ATOMS
Nuclear charge distributions deduced from the muonic atoms of ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu, 3:45766
PLUTONIUM/PRODUCTION
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 3: reprocessed fuel: plutonium product, and high level waste, 3:44264 (AECL-4436/2)
PLUTONIUM/QUANTITATIVE CHEMICAL ANALYSIS
Recovery of plutonium from carbon analysis residues, 3:45115 (DP-1495)
PLUTONIUM/RECOVERY
Recovery of plutonium from carbon analysis residues, 3:45115 (DP-1495)
PLUTONIUM 235/FISSION BARRIER
Statistical-model analysis of fission isomer production for /sup 237,235/Pu and ^{2}39Am, 3:45764
PLUTONIUM 237/FISSION BARRIER
Statistical-model analysis of fission isomer production for /sup 237,235/Pu and ^{2}39Am, 3:45764
PLUTONIUM 238/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
PLUTONIUM 238/**RADIOECOLOGICAL CONCENTRATION**
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
PLUTONIUM 239/CHARGE DISTRIBUTION
Nuclear charge distributions deduced from the muonic atoms of ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu, 3:45766
PLUTONIUM 239/**RADIATION MONITORING**
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
PLUTONIUM 239 TARGET/NEUTRON REACTIONS
General correlation for independent fission product yield uncertainties, 3:45774
Measurements of the average number of prompt neutrons emitted per fission of ^{239}Pu and ^{235}U (0.005 eV to 10 MeV), 3:45773 (ORNL/TM-6246)
PLUTONIUM 240 TARGET/NEUTRON REACTIONS
Measurements of the neutron-induced fission cross sections of ^{240}Pu, ^{242}Pu, and ^{244}Pu relative to ^{235}U from 0.1 to 30 MeV (Tables), 3:45775
Neutron capture cross-section ratios of ^{240}Pu, ^{242}Pu, ^{238}U, and ^{197}Au in the energy range from 10 to 90 keV, 3:45771
PLUTONIUM 241 TARGET/NEUTRON REACTIONS
General correlation for independent fission product yield uncertainties, 3:45774
PLUTONIUM 242 TARGET/NEUTRON REACTIONS
Measurements of the neutron-induced fission cross sections of ^{240}Pu, ^{242}Pu, and ^{244}Pu relative to ^{235}U from 0.1 to 30 MeV (Tables), 3:45775
Neutron capture cross-section ratios of ^{240}Pu, ^{242}Pu, ^{238}U, and ^{197}Au in the energy range from 10 to 90 keV, 3:45771
PLUTONIUM 244 TARGET/DEUTERON REACTIONS
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
PLUTONIUM 244 TARGET/**NEUTRON REACTIONS**
Measurements of the neutron-induced fission cross sections of ^{240}Pu, ^{242}Pu, and ^{244}Pu relative to ^{235}U from 0.1 to 30 MeV (Tables), 3:45775
PLUTONIUM 244 TARGET/**PROTON REACTIONS**
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
PLUTONIUM 244 TARGET/**TRITON REACTIONS**
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
PLUTONIUM DIOXIDE
Plutonium redistribution in mixed-oxide $(U,Pu)O_2$ nuclear fuel elements, 3:44772 (AERE-TP-714)
PLUTONIUM FLUORIDES/ELECTRONIC STRUCTURE
Calculations of the electronic structure and transitions of actinide metal hexafluorides, 3:45507
PLUTONIUM OXIDES/EMISSION SPECTROSCOPY
Single carrier method for the emission spectrometric analysis of uranium-plutonium oxides, 3:44262
PLUTONIUM OXIDES/FABRICATION
Progress on sol-gel sphere-pac development, 3:44259 (CONF-780535-1)

POINT CONTACTS
See ELECTRIC CONTACTS
POINT DEFECTS/SPATIAL DISTRIBUTION
Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals, 3:45084 (ANL-Trans-1130)
POINT MUTATIONS
See GENE MUTATIONS
POISSON EQUATION/NUMERICAL SOLUTION
Fast Poisson solvers for problems with sparsity, 3:46144
POLLUTION
(For nonradioactive pollution only; see also CONTAMINATION.)
See also AIR POLLUTION
CHEMICAL EFFLUENTS
NOISE POLLUTION
THERMAL POLLUTION
WATER POLLUTION
POLLUTION/CHEMICAL ANALYSIS
High-sensitivity Fourier transform NMR. Intermolecualr interactions between environmental toxic substances and biological macromolecules. Report for 2 October 1974-1 October 1976, 3:45297 (PB-274011)
POLLUTION/ENVIRONMENTAL EFFECTS
Environmental conditions and trends, 3:45295 (NP-23191)
POLLUTION/HAZARDS
Environmental conditions and trends, 3:45295 (NP-23191)
POLLUTION CONTROL
See also AIR POLLUTION CONTROL
LAND POLLUTION CONTROL
WATER POLLUTION CONTROL
Feasibility of restoring mercury-contaminated waters, 3:45353
POLLUTION CONTROL/COST
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume III. ferrous smelting and refining. Final report, May 1974-April 1977, 3:45364 (PB-276171)
POLLUTION CONTROL/REGULATIONS
Current regulations and enforcement experience by the environmental protection agency, 3:45356
POLLUTION CONTROL EQUIPMENT
See also AFTERBURNERS
AIR FILTERS
CATALYTIC CONVERTERS
EXHAUST RECIRCULATION SYSTEMS
SCRUBBERS
POLLUTION CONTROL EQUIPMENT/DESIGN
Additional air control device for an internal combustion engine (Patent), 3:44974
Air-to-fuel ratio controlling system for internal combustion engines (Patent), 3:44978
Engine air-to-fuel ratio control system (Patent), 3:44976
Fuel metering device (Patent), 3:44975
Method for removing hydrogen sulfide from sulfur-bearing industrial gases with clause-type reactors (Patent), 3:45236
Waste flue gas desulfurizing method (Patent), 3:44626
POLONIUM 199/NUCLEAR STRUCTURE
Nuclear Data Sheets for A=199, 3:45756
POLONIUM 203/ENERGY LEVELS
Nuclear data sheets for A=203, 3:45757
POLONIUM 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
POLYATOMIC MOLECULES/ENERGY-LEVEL TRANSITIONS
Rovibronic two-photon transitions of symmetric top molecules, 3:45489
POLYESTERS/MECHANICAL PROPERTIES
Acoustical determination of the shear relaxation functions for polymethyl methacrylate and Epon 828-Z, 3:45077
POLYETHYLENES/CHEMICAL RADIATION EFFECTS
Radiation-induced crosslinking of polyethylene in the presence of bifunctional vinyl monomers, 3:45127 (ORO-2845-T1)
POLYETHYLENES/COMBUSTION
Inhibition effects on extinction of polymer burning, 3:45129 (LBL-6898)
POLYETHYLENES/RADIOLYSIS
Radiation chemistry of polyethylene. XIV. Allyl radical decay kinetics in different types of polyethylene (γ rays), 3:45125
POLYMER FLOODING
See MICROEMULSION FLOODING
POLYSTYRENE/EXPLOSIVE FRACTURING
Effect of simultaneous and sequential detonation on explosive-induced fracture, 3:45076 (UCRL-80390)
POLYVINYLS
See also POLYSTYRENE
POLYVINYLS/PYROELECTRIC EFFECT
Piezoelectricity and pyroelectricity in polyvinylidene fluoride, 3:45080
PONDS
See LAKES
POPULATION DYNAMICS
Global environment, 3:45329 (NP-23191)
PORTABLE SOURCES
Mobile prompt-gamma in vivo neutron activation facility (^{238}Pu, Be), 3:45379 (BNL-24290)
POSITRON CAMERAS/COINCIDENCE METHODS
Circular ring transverse axial positron camera, 3:45390
POSITRON CAMERAS/CONFIGURATION
Circular ring transverse axial positron camera, 3:45390
POSITRON CAMERAS/MULTIWIRE PROPORTIONAL CHAMBERS
Two detector MWPC position camera with honeycomb lead converters for medical imaging: performance and developments, 3:45254 (LBL-7205)
POSITRON CAMERAS/PERFORMANCE
Two detector MWPC position camera with honeycomb lead converters for medical imaging: performance and developments, 3:45254 (LBL-7205)
POTASSIUM/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
POTASSIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
POTASSIUM/ELECTRON-ATOM COLLISIONS
Bremsstrahlung in collisions of fast electrons with atoms, 3:45538
POTASSIUM/REMOVAL
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
POTASSIUM/THERMODYNAMIC CYCLES
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
POTASSIUM/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
POTASSIUM 39/RANGE
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
POTASSIUM 39/STOPPING POWER
Ranges of projectiles with 8< or =Z< or =20 in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
POTASSIUM 46/ENERGY LEVELS
Nuclear data sheets for A=46, 3:45723
POTASSIUM 46/ENERGY-LEVEL TRANSITIONS
Nuclear data sheets for A=46, 3:45723
POTASSIUM CHLORIDES/PHOTOLUMINESCENCE
Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals, 3:45084 (ANL-Trans-1130)
POTASSIUM CHLORIDES/TUNNEL EFFECT
Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals, 3:45084 (ANL-Trans-1130)
POTASSIUM COMPOUNDS/DIPOLE MOMENTS
Theoretical studies of MHD plasma molecules. I. Potential energy curves and dipole moments of linear KOH, 3:45870
POTASSIUM COMPOUNDS/HYDROXIDES
Theoretical studies of MHD plasma molecules. I. Potential energy curves and dipole moments of linear KOH, 3:45870
POTENTIAL SCATTERING/COUPLED CHANNEL THEORY
Application of the method of formal series to the problem of many-channel potential scattering, 3:45678
POTENTIAL SCATTERING/K MATRIX
Application of the method of formal series to the problem of many-channel potential scattering, 3:45678
POWER DISTRIBUTION/MEASURING METHODS
Method and apparatus for monitoring the axial power distribution within the core of a nuclear reactor, exterior of the reactor (Patent), 3:44775
POWER EXCURSIONS
See EXCURSIONS
POWER GENERATION/COST
Health and environmental impacts of fluidized-bed combustion of coal, 3:44089 (CONF-780213-11)
POWER GENERATION/ENGINEERING
Impact of the technological change on energy technology (In German), 3:44606 (AED-Conf-76-399-002)
POWER GENERATION/MARGINAL-COST PRICING
Electric Utility Rate Design Study: how to quantify marginal costs, Topic 4 results for Tennessee Valley Authority, 3:44890 (NP-22554)

Electric Utility Rate Design Study: how to quantify marginal costs, a reply to Task Force 4 comments, 3:44891 (NP-22555)
POWER PLANTS
See also DUAL-PURPOSE POWER PLANTS
FUEL CELL POWER PLANTS
HYDROELECTRIC POWER PLANTS
MHD POWER PLANTS
NUCLEAR POWER PLANTS
SOLAR POWER PLANTS
WIND POWER PLANTS
POWER PLANTS/OFF-PEAK ENERGY STORAGE
Power supply with flywheel storage (Patent), 3:44840
POWER REACTORS
See also ARDENNES REACTOR
BRUCE-1 REACTOR
BRUCE-2 REACTOR
CLINCH RIVER BREEDER REACTOR
EBR-2 REACTOR
GARIGLIANO REACTOR
KANUPP REACTOR
MAINE YANKEE REACTOR
MILLSTONE-1 REACTOR
N-REACTOR
PEC BRASIMONE REACTOR
PHENIX REACTOR
PHIPPS BEND-1 REACTOR
PHIPPS BEND-2 REACTOR
PICKERING-1 REACTOR
PICKERING-2 REACTOR
PICKERING-3 REACTOR
PICKERING-4 REACTOR
PROCESS HEAT REACTORS
RWE-BAYERNWERK REACTOR
SELNI REACTOR
SGHWR REACTOR
POWER REACTORS/CONTAINMENT SHELLS
Subatmospheric double containment system (Patent), 3:44823
POWER REACTORS/REACTOR COOLING SYSTEMS
End effects on elbows subjected to moment loadings, 3:44760 (ORNL/Sub-2913/7)
POWER REACTORS/SPENT FUELS
Nuclear reactor spent fuel valuation: procedure, applications, and analysis, 3:44725 (R-2239-DOE)
POWER SYSTEMS/OSCILLATION MODES
Frequency domain analysis of low-frequency oscillations in large electric power systems. Interim report. Applications of a small-scale computer program, 3:44628 (EPRI-EL-726)
POWER SYSTEMS/THYRISTORS
Light-fired thyristor development. Interim report, 3:44629 (EPRI-EL-776)
POWER TRANSMISSION/ENGINEERING
Impact of the technological change on energy technology (In German), 3:44606 (AED-Conf-76-399-002)
POWER TRANSMISSION/MARGINAL-COST PRICING
Electric Utility Rate Design Study: how to quantify marginal costs, Topic 4 results for Tennessee Valley Authority, 3:44890 (NP-22554)
Electric Utility Rate Design Study: how to quantify marginal costs, a reply to Task Force 4 comments, 3:44891 (NP-22555)
POWER TRANSMISSION LINES/ELECTRICAL INSULATION
Self-magnetic insulation in vacuum for coaxial geometry, 3:45248
POWER TRANSMISSION LINES/SUPERCONDUCTING CABLES
Superconducting transmission: more power at half the cost, 3:44634
POWER TRANSMISSION TOWERS/PERFORMANCE TESTING
Structural feasibility of parallel-laminated veneer crossarms. Forest Service research paper, 3:44627 (AD-A-048278)
PRECIPITATIONS (ATMOSPHERIC)
See ATMOSPHERIC PRECIPITATIONS
PRESSURE GAGES/CALIBRATION
Specific volume measurements of Cu, Mo, Pd, and Ag and calibration of the ruby R_1 fluorescence pressure gauge from 0.06 to 1 Mbar, 3:45270
PRESSURE MEASUREMENT/VACUUM SYSTEMS
Pressure measurements in a cryogenic environment, 3:45225
PRESSURE VESSELS/CABLES
Tensile tests of 2500-kip prestressing tendons for the PCRV, 3:44656 (GA-A-14768)
PRESSURE VESSELS/CRACKS
Changes in fatigue crack shape during growth, 3:44750 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/DEFECTS
Evaluation of sample problem, case 1 - embedded flaw located in the Beltline Region wall of a PWR reactor vessel, 3:44649 (IAEA-18; CONF-751268-)
Methods employed by UKAEA in the evaluation of flaws, 3:44748 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/FAILURES
Effect of defects on structural failure: A two-criteria approach, 3:44749 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/FATIGUE
Effects of reactor vessel fatigue loading cycles on crack growth, 3:44745 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/FRACTURE PROPERTIES
Conclusions and recommendations, 3:44743 (IAEA-18; CONF-751268-)
Development of the tangent modulus method of elastic-plastic fracture analysis, 3:44754 (IAEA-18; CONF-751268-)
Evaluation of the HSST program intermediate pressure vessel tests in terms of light-water-reactor pressure vessel safety, 3:44643 (IAEA-18; CONF-751268-)
Fracture safety of reactor vessels in the presence of nozzle corner cracks: Netherlands research programs, 3:44753 (IAEA-18; CONF-751268-)
Influence of the stress state on the fracture toughness, 3:44744 (IAEA-18; CONF-751268-)
Written comments concerning the different topics of the meeting, 3:44751 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/NOZZLES
Fracture safety of reactor vessels in the presence of nozzle corner cracks: Netherlands research programs, 3:44753 (IAEA-18; CONF-751268-)
Some comments on the variations of crack growth along the crack front at nozzle corners, 3:44752 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/REFRACTORIES
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
PRESSURE VESSELS/STANDARDS
Final comments of the U.S. delegation concerning ASME code Section XI, Appendix A, 3:44747 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/STRAINS
Monitoring of prestressed concrete pressure vessels. 1. An overview of concrete embedment strain instrumentation and calibration test results for selected concrete embedment strain meters, 3:44761 (ORNL/TM-6191/V1)
PRESSURE VESSELS/STRESS ANALYSIS
Development of the tangent modulus method of elastic-plastic fracture analysis, 3:44754 (IAEA-18; CONF-751268-)
Influence of the stress state on the fracture toughness, 3:44744 (IAEA-18; CONF-751268-)
KWU proposal for the national practice in the assessment of integrity against fracture for nuclear components, 3:44755 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/STRESSES
C.O.D. Measuring technique on CT-specimens as applied in the Sulzer Laboratories, 3:44758 (IAEA-18; CONF-751268-)
PRESSURE VESSELS/THERMAL INSULATION
Device for thermal insulation of a prestressed concrete vessel which affords resistance to the pressure of a vaporizable fluid contained in said vessel (Patent), 3:44646
PRESSURE VESSELS/ULTRASONIC TESTING
Improved ultrasonic nondestructive testing of pressure vessels. Progress report, October 1, 1976-September 30, 1977, 3:45223 (NUREG/CR-0135)
PRESSURIZED WATER REACTORS
See PWR TYPE REACTORS
PRIMARY COOLANT CIRCUITS/ACTIVITY LEVELS
Prediction of primary circuit contamination in power reactors, 3:44654
Techniques to reduce radiation fields, 3:44797 (CONF-760688-)
PRIMARY COOLANT CIRCUITS/CORROSION PRODUCTS
Effects of hydrogen peroxide additions on shutdown chemistry transients at pressurized water reactors. Final report, 3:44647 (EPRI-NP-692)
PRIMARY COOLANT CIRCUITS/WATER CHEMISTRY
Effects of hydrogen peroxide additions on shutdown chemistry transients at pressurized water reactors. Final report, 3:44647 (EPRI-NP-692)
PROBES
See also ELECTROSTATIC PROBES
PROBES/CONSTRUCTION
Rod-shaped probe for soaking minerals to be mined, especially coal in mining (Patent), 3:44119
PROCESS HEAT REACTORS
Method to convert coal and water into at least hydrocarbon and system to carry out such a method (Patent, reactor process heat), 3:44059
PROCESS HEAT REACTORS/DISTRICT HEATING
Use of nuclear energy for district heating, 3:44728

PROCESS HEAT REACTORS/WASTE HEAT UTILIZATION
Utilization of waste heat from electricity generating stations, 3:44869 (AECL-5689)
PROCESSING (WASTES)
See WASTE PROCESSING
PRODUCER GAS/SYNTHESIS
Method and equipment for producing synthetic fuel from wastes (Patent), 3:44336
PRODUCTION
(Limited to industrial production; see also PARTICLE PRODUCTION.)
PRODUCTION/BIOPHOTOLYSIS
Utilization of solar energy through photosynthesis and artificial water photolysis, 3:44389
PROGRAMMING LANGUAGES
LCL: a compiler and language for logical mask checking, 3:45229 (SAND-77-2031)
PROMPT NEUTRONS/MULTIPLICITY
Measurements of the average number of prompt neutrons emitted per fission of ^{239}Pu and ^{235}U (0.005 eV to 10 MeV), 3:45773 (ORNL/TM-6246)
PROPENE
See PROPYLENE
PROPORTIONAL COUNTERS/COMPARATIVE EVALUATIONS
Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison, 3:45827 (BNL-24330)
PROPORTIONAL COUNTERS/PERFORMANCE
Detection of radioactive surface and weld contamination (ThO_2 and $^{233}UO_2$) on light water breeder reactor fuel rods using alpha ionization detectors (LWBR development program), 3:44697 (WAPD-TM-1130)
PROPPING AGENTS/EMPLACEMENT
Log-inject-log in sand consolidation (Patent; for determining adequacy of placement of sand consolidating plastic), 3:44147
PROPYLENE/PHOTOCHEMICAL REACTIONS
Measurement of rate constants of importance in smog. Final report, April 1973-July 1977, 3:45298 (PB-274530)
PROSTAGLANDINS/BIOCHEMICAL REACTION KINETICS
Alpha-adrenergic receptor modulation of beta-adrenergic, adenosine and prostaglandin E_1 increased adenosine 3′:5′-cyclic monophosphate levels in primary cultures of glia (Rat cerebral cortical tissue), 3:45367 (UCLA-12-1145)
PROTACTINIUM 234/ISOMERIC TRANSITIONS
Decay of ^{2}34Th to the ^{2}34Pa isomers, 3:45768
PROTECTION (RADIATION)
See RADIATION PROTECTION
PROTECTIVE CLOTHING/PERFORMANCE TESTING
Respirator studies for the DOE Division of Operational and Environmental Safety. Progress report, October 1, 1976-September 30, 1977, 3:45147 (LA-6969-PR)
PROTEINS/BIOSYNTHESIS
Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer, 3:45375 (UR-3490-1379)
PROTEINS/MOLECULAR WEIGHT
Toxicity of cadmium: mechanism and diagnosis, 3:45424
PROTEINS/PHYSICAL PROPERTIES
Isolation and characterization of two threonine-poor apolipoproteins of human plasma high density lipoproteins, 3:45368
PROTON BEAMS/TRAPPING
Computer simulation studies of strong proton rings, 3:45882
PROTON REACTIONS/CHARGE-EXCHANGE REACTIONS
Gamma radiation from the reaction ^{1}05Pd(p,nγ)^{1}05Ag, 3:45744
PROTON REACTIONS/ELASTIC SCATTERING
Analyzing power in proton-nucleus elastic scattering at 0.8 GeV, 3:45702
p-^{4}He elastic scattering at 5.75 GeV/c, 3:45573
PROTON REACTIONS/FISSION
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
PROTON REACTIONS/FRAGMENTATION
Energy spectra of nuclear fragments produced by high energy protons, 3:45707
PROTON REACTIONS/INCLUSIVE INTERACTIONS
Inclusive pion production in relativistic proton collisions with nuclei, a reexamination, 3:45637
PROTON REACTIONS/INELASTIC SCATTERING
Extension of core polarization in inelastic scattering to include charge-exchange reactions, 3:45792
PROTON REACTIONS/PARTICLE PRODUCTION
Correlations between two hadrons at large transverse momenta, 3:45575
PROTON REACTIONS/PICKUP REACTIONS
Distorted-wave Born-approximation description of the ^{4}He(p,d)^{3}He reaction at E/sub p/ = 770 MeV, 3:45684
Levels in ^{1}89Ir and ^{1}91Ir observed in the (p,t) reaction, 3:45747
PROTON REACTIONS/SPALLATION
Energy spectra of nuclear fragments produced by high energy protons, 3:45707
Isotopic dependence of the yield of ^{1}7N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
PROTON-ANTIPROTON INTERACTIONS/C INVARIANCE
Test of charge-conjugation invariance in p-barp interactions, 3:45576
PROTON-DEUTERON INTERACTIONS/INELASTIC SCATTERING
Associative multiplicity in scattering by a deuteron with large momentum transfer, 3:45643
PROTON-DEUTERON INTERACTIONS/RESCATTERING
Associative multiplicity in scattering by a deuteron with large momentum transfer, 3:45643
PROTON-NEUTRON INTERACTIONS/BREMSSTRAHLUNG
Neutron-proton bremsstrahlung results at 200 MeV, 3:45685
PROTON-NEUTRON INTERACTIONS/CHARGE-EXCHANGE INTERACTIONS
Implications of nucleon-nucleon spin-polarization measurements, 3:45636
PROTON-NEUTRON INTERACTIONS/ELASTIC SCATTERING
Implications of nucleon-nucleon spin-polarization measurements, 3:45636
Polarization parameter for nucleon-nucleon elastic scattering at 11.8 GeV/c, 3:45577
PROTON-PROTON INTERACTIONS/CROSS SECTIONS
Energy Dependence of Opaqueness for pp Collisions at High Energies, 3:45574
PROTON-PROTON INTERACTIONS/DIFFERENTIAL CROSS SECTIONS
Possible existence of a second minimum in elastic pp scattering, 3:45640
PROTON-PROTON INTERACTIONS/ELASTIC SCATTERING
Energy Dependence of Opaqueness for pp Collisions at High Energies, 3:45574
Implications of nucleon-nucleon spin-polarization measurements, 3:45636
Polarization parameter for nucleon-nucleon elastic scattering at 11.8 GeV/c, 3:45577
Possible existence of a second minimum in elastic pp scattering, 3:45640
Unitarity condition and large-angle elastic scattering, 3:45645
PROTON-PROTON INTERACTIONS/INCLUSIVE INTERACTIONS
Can existing high-transverse-momentum hadron experiments be interpreted by contemporary quantum chromodynamics ideas, 3:45639
Can the Fermi motion of partons recover canonical scaling in hadronic high-p/sub T/ processes, 3:45638
Determination of the sea-quark distributions in the proton by single-particle inclusive reactions, 3:45604
PROTON-PROTON INTERACTIONS/PAIR PRODUCTION
Testing quantum chromodynamics in the hadroproduction of real and virtual photons, 3:45669
PROTON-PROTON INTERACTIONS/PARTICLE PRODUCTION
Search for magnetic monopoles at the CERN Intersecting Storage Rings, 3:45578
PROTON-PROTON INTERACTIONS/TRANSVERSE MOMENTUM
Can existing high-transverse-momentum hadron experiments be interpreted by contemporary quantum chromodynamics ideas, 3:45639
PROTONS/FRAGMENTATION
s-dependence of proton fragmentation by hadrons. II. Incident laboratory momenta 30-250 GeV/c, 3:45582
PROTONS/MAGNETIC MOMENTS
NMR determination of the triton-proton magnetic moment ratio to within 10^{-6}%, 3:45517
PROTONS/MICRODOSIMETRY
Microdosimetric results obtained by proportional counter and ionization chamber methods: a comparison, 3:45827 (BNL-24330)
PROTONS/MULTIPLE PRODUCTION
Production of relativistic particles on nuclei at large angles and the role of multiple processes, 3:45642
PROTOPLASTS
See PLANT CELLS
PSI RESONANCES/PARTICLE PRODUCTION
Gluon contribution to hadronic J/psi production, 3:45626

PSI-3105 RESONANCES/DECAY
Baryonic decays of the psi (3095), 3:45565
PSI-3105 RESONANCES/PARTICLE PRODUCTION
Production of J/Psi particles by 43-GeV/c π^- mesons on the nuclei Be, Cu, and W, 3:45586
PSI-3695 RESONANCES/DECAY
Radiative decays of the psi (3684) into high-mass states, 3:45602
PSI-3695 RESONANCES/FORBIDDEN TRANSITIONS
Forbidden decays psi' → eta + psi and psi' → π^0 + psi, 3:45651
PUBLIC UTILITIES
See also ELECTRIC UTILITIES
PUBLIC UTILITIES/ENERGY CONSERVATION
Energy conservation: policy considerations for The States (Study by Council of State Governments), 3:44871
PULSARS/STAR MODELS
Radio pulsar model, 3:45444
PUMPED STORAGE POWER PLANTS/WATER RESERVOIRS
Reservoirs for hydropower and improved pump-fed power stations in neighboring foreign countries, 3:44837
PVC
(Polyvinyl chloride.)
PVC/COMBUSTION
Inhibition effects on extinction of polymer burning, 3:45129 (LBL-6898)
PWR TYPE REACTORS
See also ARDENNES REACTOR
LOFT REACTOR
MAINE YANKEE REACTOR
MUTSU REACTOR
SELNI REACTOR
PWR TYPE REACTORS/ECCS
SUNYAB/EPRI Combined Injection ECC Program. Interim report, 3:44802 (EPRI-NP-757)
System for the emergency injection of liquid into a nuclear reactor core (Patent), 3:44652
PWR TYPE REACTORS/ELECTRICAL EQUIPMENT
Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples, 3:44812 (SAND-78-0718)
PWR TYPE REACTORS/FLOWMETERS
N-16 Transit Time Flow Measurement System (TTFM) description and performance, 3:44651 (WCAP-9264)
PWR TYPE REACTORS/FUEL ASSEMBLIES
Holddown device for nuclear fuel assembly (Patent), 3:44653
PWR TYPE REACTORS/FUEL ELEMENT CLUSTERS
Spacer capture rod to spacer grid attachment device (Patent), 3:44644
PWR TYPE REACTORS/FUEL ELEMENTS
Fuel performance improvement program. Quarterly progress report, October-December 1977, 3:44639 (COO-4066-5)
Spatial distribution of fission product energy, 3:44831
PWR TYPE REACTORS/FUEL PINS
Performance testing of single electrically heated fuel pin simulators for PWR LOCA experiments, 3:44808 (ORNL/NUREG-35)
PWR TYPE REACTORS/LOSS OF COOLANT
Characteristics and stability analyses of transient one-dimensional two-phase flow equations and their finite difference approximations, 3:44820
Performance testing of single electrically heated fuel pin simulators for PWR LOCA experiments, 3:44808 (ORNL/NUREG-35)
PWR FLECHT skewed profile low flooding rate test series evaluation report, 3:44819 (WCAP-9183)
Testing to evaluate synergistic effects from LOCA environments. Test IX. Simultaneous mode; cables, splice assemblies, and electrical insulation samples, 3:44812 (SAND-78-0718)
PWR TYPE REACTORS/MELTDOWN
Light water reactor safety research program. Quarterly report, July-September 1977 (Corium-concrete interactions; vapor explosions), 3:44810 (SAND-78-0076)
PWR TYPE REACTORS/MOLTEN METAL-WATER REACTIONS
Light water reactor safety research program. Quarterly report, July-September 1977 (Corium-concrete interactions; vapor explosions), 3:44810 (SAND-78-0076)
PWR TYPE REACTORS/POWER DISTRIBUTION
Method and apparatus for monitoring the axial power distribution within the core of a nuclear reactor, exterior of the reactor (Patent), 3:44775
PWR TYPE REACTORS/PRESSURE VESSELS
Evaluation of the HSST program intermediate pressure vessel tests in terms of light-water-reactor pressure vessel safety, 3:44643 (IAEA-18; CONF-751268-)
Evaluation of sample problem, case 1 - embedded flaw located in the Beltline Region wall of a PWR reactor vessel, 3:44649 (IAEA-18; CONF-751268-)
PWR TYPE REACTORS/PRIMARY COOLANT CIRCUITS
Effects of hydrogen peroxide additions on shutdown chemistry transients at pressurized water reactors. Final report, 3:44647 (EPRI-NP-692)
Prediction of primary circuit contamination in power reactors, 3:44654
PWR TYPE REACTORS/RADIOACTIVE EFFLUENTS
Measurement of liquid radioactive materials for monitoring radioactive emissions. Draft, 3:44714
PWR TYPE REACTORS/REACTOR ACCIDENTS
Probabalistic analysis of the protection of a PWR against overpressure, 3:44804 (EUR-5640)
PWR TYPE REACTORS/REACTOR COOLING SYSTEMS
EPRI programs in power reactor radiation control, 3:44638
Overview of the activated corrosion product reduction program for US power reactors, 3:44828
PWR TYPE REACTORS/RHR SYSTEMS
Failure Modes and Effects Analysis (FMEA) of the Residual Heat Removal System, 3:44650 (WCAP-8967)
PYRENE/REMOVAL
Clean coal combustion through coal washing and blending, 3:44126 (PB-274406)
PYRITE/CHEMICAL REACTIONS
Action of aqueous alkali on pyrite (Ph.D. dissertation), 3:44030 (IS-ICP-51)
Desulfurizing coal with solutions containing dissolved oxygen, 3:44029 (IS-ICP-48)
PYRITE/REMOVAL
Action of aqueous alkali on pyrite (Ph.D. dissertation), 3:44030 (IS-ICP-51)
Desulfurizing coal with solutions containing dissolved oxygen, 3:44029 (IS-ICP-48)
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
PYROLYSIS
See also CRACKING
PYROLYSIS/MATHEMATICAL MODELS
Mathematical model for pyrolysis of a solid particle: effects of the heat of reaction, 3:44070
PYROLYSIS/RESEARCH PROGRAMS
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
PYROLYTIC CARBON/SPECIFIC HEAT
Low-temperature specific heat, thermal conductivity, and ultrasonic velocity of glassy carbons, 3:45096
PYROLYTIC CARBON/THERMAL CONDUCTIVITY
Low-temperature specific heat, thermal conductivity, and ultrasonic velocity of glassy carbons, 3:45096
PYROLYTIC CARBON/ULTRASONIC WAVES
Low-temperature specific heat, thermal conductivity, and ultrasonic velocity of glassy carbons, 3:45096
PYROLYTIC CARBON/X-RAY DIFFRACTION
Small-angle x-ray scattering from oriented ellipsoidal voids in pyrolytic graphite, 3:45082
PYRROLIDONES/USES
N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX-613-1955(Rev.))

Q

Q DEVICES/PLASMA WAVES
Higher-harmonic generation in a plasma excited at the lower hybrid frequency, 3:46057
QUANTITATIVE CHEMICAL ANALYSIS/ALGORITHMS
Development of control algorithms for chemistry systems. Final report, September 1, 1978-September 30, 1977, 3:45109 (UCRL-13826)
QUANTUM CHROMODYNAMICS/ALGEBRA
Classical algebraic chromodynamics, 3:45656
QUANTUM CHROMODYNAMICS/HADRON-HADRON INTERACTIONS
Quantum-chromodynamic spin-spin asymmetries in large-P/sub T/ hadron production with polarized beam and target, 3:45629
QUANTUM CHROMODYNAMICS/INCLUSIVE INTERACTIONS
Can existing high-transverse-momentum hadron experiments be interpreted by contemporary quantum chromodynamics ideas, 3:45639
QUANTUM CHROMODYNAMICS/MASSLESS PARTICLES
Equivalence of worlds with different θ values in massless quantum chromodynamics, 3:45658

QUANTUM CHROMODYNAMICS/PAIR PRODUCTION
Testing quantum chromodynamics in the hadroproduction of real and virtural photons, 3:45669
QUANTUM CHROMODYNAMICS/PERTURBATION THEORY
Non-Abelian gauge theories of Fermi systems: Quantum-chromodynamic theory of highly condensed matter, 3:45441
QUANTUM CHROMODYNAMICS/QUARK MODEL
Instantaneous approximation for a gauge theory with dressed vertices, 3:45592
Static limit of quantum chromodynamics, 3:45670
QUANTUM CHROMODYNAMICS/REVIEWS
Charmonium and quantum chromodynamics, 3:45673
QUANTUM CHROMODYNAMICS/SU-3 GROUPS
Toward a theory of the strong interactions, 3:45666
QUANTUM CHROMODYNAMICS/UPSILON RESONANCES
Hadronic Y production, parton distributions, and quantum chromodynamics, 3:45593
QUANTUM ELECTRODYNAMICS/FOUR-DIMENSIONAL CALCULATIONS
Quantum Electrodynamics Within the Framework of a New Four-Dimensional Symmetry, 3:45668
QUANTUM FIELD THEORY
See also QUANTUM ELECTRODYNAMICS
QUANTUM FIELD THEORY/CLASSICAL MECHANICS
Effects of classical fields in meson correlations, 3:45659
QUANTUM FIELD THEORY/GOLDSTONE BOSONS
Field theory on a lattice: Absence of goldstone bosons in the U(1) model in two dimensions, 3:45655
QUANTUM FIELD THEORY/STATISTICAL MECHANICS
Effects of classical fields in meson correlations, 3:45659
QUANTUM FIELD THEORY/VACUUM POLARIZATION
Vacuum polarization in strong fields and pion condensation, 3:45789
QUANTUM MECHANICS
Classical realization of quantum mechanics, 3:45854
Macroscopic description of laser-type matter. Final technical report (3rd year), August 1976-August 1977, 3:45851 (AD-A-048442)
QUANTUM MECHANICS/EIGENFUNCTIONS
Asymptotic behavior of bound eigenfunctions of Hamiltonians for single-variable systems, 3:45853
QUANTUM MECHANICS/THREE-BODY PROBLEM
Schroedinger perturbation theory in the adiabatic representation of the three-body problem, 3:45521
QUARK CONFINEMENT
See BAG MODEL
QUARK MODEL/DEEP INELASTIC SCATTERING
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
QUARK MODEL/NUCLEAR FORCES
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
QUARK MODEL/QUANTUM NUMBERS
Structure of elementary particles and relationships between the different forces of nature, 3:45597
QUARK MODEL/REVIEWS
Structure of elementary particles and relationships between the different forces of nature, 3:45597
QUARK MODEL/SYMMETRY GROUPS
Reduction of the direct product of irreducible representations of the supersymmetry group in the rest frame, 3:46146
QUARKS/BOUND STATE
Implications of the Y (9.5) for gauge theories of weak interactions, 3:45620
QUARKS/COUPLING CONSTANTS
Determination of the weak neutral-current couplings, 3:45616
QUARKS/ELASTIC SCATTERING
Can the Fermi motion of partons recover canonical scaling in hadronic high-p/sub T/ processes, 3:45638
QUARKS/PARTICLE IDENTIFICATION
Search for +1/3e fractional charges in Nb, W, and Fe metal, 3:45558
Search for fractionally charged particles in sea water, ocean sediment deposits, and volcanic lava, 3:45557
QUARKS/QUANTUM CHROMODYNAMICS
Non-Abelian gauge theories of Fermi systems: Quantum-chromodynamic theory of highly condensed matter, 3:45441
QUASARS/RADIOWAVE RADIATION
Radio emission from quasars and BL Lac objects by coherent plasma oscillation and stimulated Compton scattering, 3:45450 (LA-UR-78-1199)
QUASI-FISSION/NUCLEAR REACTION KINETICS
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
QUEUES
Conditions for product form network solution through the analysis of finite queues with overflows, 3:46134 (BNL-24181)
QUIESCENT PLASMA/TRANSPORT THEORY
Transport of a nonneutral electron plasma due to electron collisions with neutral atoms, 3:45955

R

R-A REACTOR/PERSONNEL
Analysis of external exposures of the personnel operating the RA reactor at Vinca for 1967-1976 period, 3:44788
RADIATION DOSES/COMPUTER CALCULATIONS
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
RADIATION EXPOSURE (DOSES)
See RADIATION DOSES
RADIATION HAZARDS
Radiological protection. First European symposium on rad-equivalence, 3:45400
RADIATION HYGIENE
See RADIATION PROTECTION
RADIATION PROTECTION
Designing to minimize radiation exposure, 3:44795 (CONF-760688-)
RADIATION PROTECTION/MEETINGS
Radiological protection. First European symposium on rad-equivalence, 3:45400
RADIATION PROTECTION/SAFETY STANDARDS
Shielding standards: a case history, 3:45825
RADIATION SAFETY
See RADIATION PROTECTION
RADIATION SOURCES
(For cosmic sources of radiation see also COSMIC GAMMA SOURCES, COSMIC RADIO SOURCES, and COSMIC X-RAY SOURCES.)
See also ALPHA SOURCES
BETA SOURCES
GAMMA SOURCES
LIGHT SOURCES
PORTABLE SOURCES
X-RAY SOURCES
RADIATION SOURCES/FABRICATION
Sources of nuclear radiation (Patent), 3:44322
RADIATION TRANSPORT
See also NEUTRON TRANSPORT
RADIATION TRANSPORT/SIMULATION
Direction dependent exponential biassing in Monte Carlo simulation of radiation transport in thick shields, 3:45813
RADICALS/CHEMICAL REACTION KINETICS
Direct detection of the biradicals generated in the Norrish type II reaction (Photolysis of phenyl alkyl ketones), 3:45124
RADIO EQUIPMENT/ELECTROMAGNETIC FIELDS
Seafarer: impacts and studies of the extremely low frequency communication system (a bibliography with abstracts). Report for 1964-January 1978, 3:45425 (NTIS/PS-78/0062)
RADIO EQUIPMENT/PERFORMANCE
Seafarer: impacts and studies of the extremely low frequency communication system (a bibliography with abstracts). Report for 1964-January 1978, 3:45425 (NTIS/PS-78/0062)
RADIO RECEIVERS
See RADIO EQUIPMENT
RADIO TRANSMITTERS
See RADIO EQUIPMENT
RADIOACTIVE AEROSOLS/FILTRATION
Filtration of aerosols produced by a sodium fire, 3:44824
RADIOACTIVE AEROSOLS/PRECIPITATION SCAVENGING
Design of an accurate calculation method for the settling of radioactive substances from the exhaust of nuclear plants due to precipitation, 3:45319 (ORNL-tr-4543)
RADIOACTIVE AEROSOLS/SURFACE CONTAMINATION
Design of an accurate calculation method for the settling of radioactive substances from the exhaust of nuclear plants due to precipitation, 3:45319 (ORNL-tr-4543)
RADIOACTIVE BIOLOGICAL WASTES
See RADIOACTIVE WASTES
RADIOACTIVE EFFLUENTS
See also RADIOACTIVE WASTES

RADIOACTIVE EFFLUENTS/ENVIRONMENTAL TRANSPORT
Design of an accurate calculation method for the settling of radioactive substances from the exhaust of nuclear plants due to precipitation, 3:45319 (ORNL-tr-4543)
Draft environmental impact statement. Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico, 3:45324 (DOE/EIS-0018-D)
Geosphere model: description, opinions, and input requirements (Radionuclide migration in ground water), 3:45359 (BNWL-tr-268)
RADIOACTIVE EFFLUENTS/RADIATION MONITORING
Measurement of liquid radioactive materials for monitoring radioactive emissions. Draft, 3:44714
RADIOACTIVE MATERIALS/CRITICALITY
Review of criteria for nuclear criticality safety control in transportation, 3:44273 (CONF-780506-22)
RADIOACTIVE MATERIALS/LAND TRANSPORT
Cargo-Restraint-Transporter (CRT): a novel approach to the handling of cargo on DOE's Safe-Secure Trailers (SST), 3:44274 (Y/OA-2034)
RADIOACTIVE MATERIALS/RAIL TRANSPORT
Cargo response to railcar impact and tiedown load analysis, 3:45152 (LA-UR-78-1210)
RADIOACTIVE MATERIALS/TRANSPORT
Analysis of alternative transportation methods for radioactive materials shipments including the use of special trains for spent fuel and wastes (Radiological impact), 3:44272 (CONF-780506-9)
Review of criteria for nuclear criticality safety control in transportation, 3:44273 (CONF-780506-22)
RADIOACTIVE PARTICULATES
See PARTICLES
RADIOACTIVE WASTE DISPOSAL/GEOLOGIC DEPOSITS
Deformation of a jointed rock mass, 3:44297 (ORNL-tr-4567)
RADIOACTIVE WASTE DISPOSAL/MILL TAILINGS
Disposal of solid wastes and liquid effluents from the milling of uranium ores, 3:44289 (CANMET-76-19)
RADIOACTIVE WASTE DISPOSAL/RADIATION MONITORING
Formerly utilized MED/AEC sites remedial action program. Radiological survey of site A, Palos Park Forest Preserve, Chicago. Final report, 3:44301 (DOE/EV-0005/7)
RADIOACTIVE WASTE DISPOSAL/SOLID WASTES
Assessment of Hanford burial grounds and interim TRU storage, 3:44292 (RHO-CD-78(Rev.))
RADIOACTIVE WASTE DISPOSAL/UNDERGROUND DISPOSAL
Assessment of Hanford burial grounds and interim TRU storage, 3:44292 (RHO-CD-78(Rev.))
RADIOACTIVE WASTE MANAGEMENT
See also RADIOACTIVE WASTE STORAGE
Management of nuclear waste, 3:44288 (AECL-5800)
RADIOACTIVE WASTE MANAGEMENT/COORDINATED RESEARCH PROGRAMS
Communities R and D Programme: radioactive waste management and storage. 1. Annual progress report, 3:44277 (EUR-5749)
RADIOACTIVE WASTE MANAGEMENT/PUBLIC OPINION
Attitudes of the public about nuclear wastes, 3:44296
RADIOACTIVE WASTE MANAGEMENT/SITE SELECTION
Assessment of the Nevada Test Site for low-level waste management, 3:44291 (NVO-193)
RADIOACTIVE WASTE PROCESSING
Device for filling a container with radioactive wastes (Patent), 3:44284
Separation and recycling of actinides: a review of the state of the art, 3:44279 (EUR-5801)
RADIOACTIVE WASTE PROCESSING/ADSORPTION
Method for treating radioactive waste water (Patent), 3:44283
RADIOACTIVE WASTE PROCESSING/CALCINATION
Pilot-plant development of a Rover waste calcination flowsheet, 3:44280 (ICP-1148)
RADIOACTIVE WASTE PROCESSING/COMBUSTION
Volume reduction system for solid and liquid TRU waste from the nuclear fuel cycle: January-March 1978, 3:44281 (MLM-2517)
RADIOACTIVE WASTE PROCESSING/GASEOUS WASTES
Measurement of the distribution of ^{129}I in and its discharge from the Karlsruhe Reprocessing Plant, 3:44303 (BNWL-tr-311)
Method of processing radioactive vent gases (Patent), 3:44287
RADIOACTIVE WASTE PROCESSING/LIQUID WASTES
Method of processing liquid radioactive wastes (Patent), 3:44285
RADIOACTIVE WASTE PROCESSING/MELTING
Volume reduction of low-level contaminated metal waste by melting: selection of method and conceptual plan, 3:44282 (ORNL/TM-6388)
RADIOACTIVE WASTE PROCESSING/SOLIDIFICATION
Fixation of radioactive waste in glass, 3:44278 (AECL-5800)
Method for treating radioactive waste water (Patent), 3:44283
Method of processing liquid radioactive wastes (Patent), 3:44285
Method of filling with radioactive wastes (Patent), 3:44286
Method of storing radioactive wastes (Patent), 3:44298
Volume reduction system for solid and liquid TRU waste from the nuclear fuel cycle: January-March 1978, 3:44281 (MLM-2517)
RADIOACTIVE WASTE STORAGE
Method of storing radioactive wastes (Patent), 3:44298
RADIOACTIVE WASTE STORAGE/MATERIALS
Chemical durability of glasses suitable for the storage of high level radioactive wastes. I. On the mechanism of dissolution of the glasses of borax-alumina-silica system in water, 3:44300 (ORNL-tr-4626)
RADIOACTIVE WASTE STORAGE/RADIATION EFFECTS
Effect of internal alpha radiation on borosilicate glass containing Savannah River Plant waste, 3:44290 (DP-1482)
RADIOACTIVE WASTE STORAGE/RADIATION HAZARDS
Calculation of potential danger of stored wastes (In air and water), 3:44304 (ORNL-tr-4598)
RADIOACTIVE WASTE STORAGE/SOLID WASTES
Assessment of Hanford burial grounds and interim TRU storage, 3:44292 (RHO-CD-78(Rev.))
RADIOACTIVE WASTE STORAGE/SOLIDIFICATION
Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system, 3:44299 (ORNL-tr-4632)
RADIOACTIVE WASTE STORAGE/TANKS
Environmental effects on metal structures and connection in NFS waste tanks, 3:44294 (UCRL-13837)
Evaluation of the integrity of existing NFS waste tanks, 3:44295 (UCRL-13839)
RADIOACTIVE WASTE STORAGE/UNDERGROUND STORAGE
Assessment of the Nevada Test Site for low-level waste management, 3:44291 (NVO-193)
RADIOACTIVE WASTES
See also HIGH-LEVEL RADIOACTIVE WASTES
RADIOACTIVE EFFLUENTS
RADIOACTIVE WASTES/LEACHING
Fixation of radioactive waste in glass, 3:44278 (AECL-5800)
RADIOACTIVE WASTES/PACKAGING
Device for filling a container with radioactive wastes (Patent), 3:44284
Method of filling with radioactive wastes (Patent), 3:44286
RADIOACTIVE WASTES/WASTE TRANSPORTATION
Analysis of alternative transportation methods for radioactive materials shipments including the use of special trains for spent fuel and wastes (Radiological impact), 3:44272 (CONF-780506-9)
Current status and future considerations for a transportation system for spent fuel and radioactive waste, 3:44275 (Y/OWI/SUB-77/42513)
RADIOAPPLICATORS
See RADIATION SOURCES
RADIOBIOLOGICAL EFFECTS
See BIOLOGICAL RADIATION EFFECTS
RADIOBIOLOGY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
RADIOCARBON DATING
See CARBON 14
RADIOCHEMICAL ANALYSIS/DATA PROCESSING
Computerized radionuclidic analysis in production facilities (Pulse height analysis), 3:45111 (DPSPU-77-30-10)
RADIODIAGNOSIS (RADIONUCLIDES)
See NUCLEAR MEDICINE
RADIOGRAPHS
See IMAGES
RADIOGRAPHY (BIOMEDICAL)
See BIOMEDICAL RADIOGRAPHY
RADIOISOTOPE KINETICS
See RADIONUCLIDE KINETICS
RADIOISOTOPE MIGRATION
See RADIONUCLIDE MIGRATION
RADIOISOTOPE SCANNING
See also SCINTISCANNING
RADIOISOTOPE SCANNING/DATA ANALYSIS
Noninvasive brain imaging: computed tomography and radionuclides (Book), 3:45384

RADIOISOTOPES/ENVIRONMENTAL TRANSPORT
Evaluation of models used for the assessment of radionuclide releases to the environment. Progress report, April 1976-December 1977, 3:45317 (ORNL-5382)
RADIOISOTOPES/RADIOCHEMICAL ANALYSIS
Computerized radionuclidic analysis in production facilities (Pulse height analysis), 3:45111 (DPSPU-77-30-10)
RADIOISOTOPES/RETENTION FUNCTIONS
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
RADIOISOTOPES/TISSUE DISTRIBUTION
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
RADIONUCLIDE KINETICS
(In living organisms.)
RADIONUCLIDE KINETICS/MATHEMATICAL MODELS
INREM II: a computer implementation of recent models for estimating the dose equivalent to organs of man from an inhaled or ingested radionuclide, 3:45402 (ORNL/NUREG/TM-84)
RADIONUCLIDE MIGRATION
(In environment.)
RADIONUCLIDE MIGRATION/COMPUTER CALCULATIONS
Geosphere model: description, opinions, and input requirements (Radionuclide migration in ground water), 3:45359 (BNWL-tr-268)
RADIONUCLIDES
See RADIOISOTOPES
RADIOPHARMACEUTICALS/MEETINGS
Radiopharmaceuticals (Book), 3:45391
RADIOSURGERY
See RADIOTHERAPY
RADIOTHERAPY
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
RADIOTHERAPY/FRACTIONATED IRRADIATION
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (X and gamma radiation, electrons, negative pions), 3:45398 (STI/PUB-441(Vol.1))
RADIOTHERAPY/PLANNING
Investigation of the microdosimetric characteristics of broad, therapeutic beams of negative pions at LAMPF, 3:45396 (LA-UR-78-1205)
RADIOTHERAPY/REVIEWS
Review of the use of ionizing radiation for the treatment of benign diseases. Volume I. Committee's report. Final report, 3:45380 (PB-274032)
RADON/EXHALATION
Laboratory research on tailings stabilization methods and their effectiveness in radiation containment (Uranium, reduction of radon exhalation), 3:45314 (GJT-21)
RADON 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
RARE EARTHS
See also DYSPROSIUM
EUROPIUM
TERBIUM
THULIUM
YTTERBIUM
RARE EARTHS/BINDING ENERGY
Regularities in s-electron binding energies in l/sup N/s/sup M/ configurations, 3:45548
RARE EARTHS/ELECTRIC CONDUCTIVITY
Anisotropy of the electrical resistivity of rare-earth metals, 3:45033
RARE EARTHS/ENERGY LEVELS
Regularities in s-electron binding energies in l/sup N/s/sup M/ configurations, 3:45548
RATE STRUCTURE/MARGINAL-COST PRICING
Electric Utility Rate Design Study: making the transition from unit marginal costs to rates. Results for Portland General Electric Company, 3:44892 (NP-22556)
REACTOR ACCIDENTS
See also EXCURSIONS
LOSS OF COOLANT
MELTDOWN
REACTOR CORE DISRUPTION
Evaluation of the General Atomic codes TAP and RECA for HTGR accident analyses, 3:44809 (ORNL/NUREG/TM-178)
Probabalistic analysis of the protection of a PWR against overpressure, 3:44804 (EUR-5640)
REACTOR ACCIDENTS/RADIATION HAZARDS
Investigations of the adequacy of the meteorological transport model developed for the reactor safety study, 3:44811 (SAND-78-0574C)
REACTOR ACCIDENTS/TWO-PHASE FLOW
Two-phase flow measurement by radioactive tracer techniques, 3:44798 (CONF-771126-8)
REACTOR CELLS/NEUTRON TRANSPORT
CONIFERS: a neutronics code for reactors with channels, 3:44730 (AECL-5305)
REACTOR CHARGING MACHINES/BALL BEARINGS
Effects of various treatments on the serviceability of water-immersed carbon-steel ball bearings (for CANDU type reactor fuelling machines), 3:44668 (AECL-5823)
Testing of unlubricated water-immersed carbon-steel ball bearings (CANDU reactor fuelling machines), 3:44669 (AECL-5824)
REACTOR CHARGING MACHINES/SHIELDING
Handling apparatus for a nuclear reactor fuel assembly (Patent), 3:44762
REACTOR COMPONENTS
See also BREEDING BLANKETS
CONTROL ELEMENTS
FUEL ELEMENTS
REACTOR CHARGING MACHINES
REACTOR COOLING SYSTEMS
REACTOR CORES
REACTOR COMPONENTS/COATINGS
Friction, wear, and corrosion of laves-hardened nickel alloy hardsurfacing in sodium, 3:44695 (HEDL-SA-1391)
REACTOR COMPONENTS/DECONTAMINATION
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978 (LMFBR), 3:44685 (AI-DOE-13231)
REACTOR COMPONENTS/FAILURE MODE ANALYSIS
Review of methods for the integration of reliability and design engineering, 3:44807 (GA-A-14748)
REACTOR COMPONENTS/FRACTURE PROPERTIES
Behaviour of Cracks and its analysis using fracture mechanics, 3:44757 (IAEA-18; CONF-751268-)
Fracture mechanics and welding, 3:44756 (IAEA-18; CONF-751268-)
Nuclear installation inspectorate presentation, 3:44742 (IAEA-18; CONF-751268-)
REACTOR COMPONENTS/NONDESTRUCTIVE TESTING
Non-destructive testing, fracture mechanics and defect tolerances, 3:44759 (IAEA-18; CONF-751268-)
REACTOR COMPONENTS/SEISMIC EFFECTS
Effective mass and damping of submerged structures, 3:44817 (UCRL-52342)
REACTOR CONTROL RODS
See CONTROL ELEMENTS
REACTOR CONTROL SYSTEMS
(The processes and operations ensuring the control and safe running of a nuclear reactor.)
Control for nuclear thermionic power source (Patent), 3:44774
REACTOR CONTROL THEORY
See REACTOR KINETICS
REACTOR COOLING SYSTEMS
See also PRIMARY COOLANT CIRCUITS
RHR SYSTEMS
SHROUDS
REACTOR COOLING SYSTEMS/ACTIVITY LEVELS
EPRI programs in power reactor radiation control, 3:44638
Overview of the activated corrosion product reduction program for US power reactors, 3:44828
Predicting radiation fields around reactor components, 3:44796 (CONF-760688-)
Radiation safety of nuclear power plants with large channel-type reactors, 3:44827
REACTOR COOLING SYSTEMS/LEAKS
Leakage effects on LMFBR cell liners, 3:44813 (SAND-78-0742C)
REACTOR COOLING SYSTEMS/PIPE FITTINGS
End effects on elbows subjected to moment loadings, 3:44760 (ORNL/Sub-2913/7)
REACTOR COOLING SYSTEMS/SEALS
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978 (LMFBR), 3:44685 (AI-DOE-13231)
REACTOR CORE DISRUPTION/FLUID FLOW
Effects of internal circulation velocity and noncondensable gas on vapor condensation from a rising bubble (LMFBR), 3:44821
REACTOR CORE DISRUPTION/HEAT TRANSFER
Effects of internal circulation velocity and noncondensable gas on vapor condensation from a rising bubble (LMFBR), 3:44821

REACTOR CORES/DESIGN
Design and economics of large LMFBRs, 3:44693 (HEDL-SA-1321)
REACTOR CORES/SEISMIC EFFECTS
COCO: a computer program for seismic analysis of a single column of the HTGR core, 3:44805 (GA-A-14600)
REACTOR DISMANTLING
View toward the disposition of retired nuclear power stations, 3:44833 (ORNL-tr-4660)
REACTOR FUEL ELEMENTS
See FUEL ELEMENTS
REACTOR FUELS
See NUCLEAR FUELS
REACTOR KINETICS/DATA ANALYSIS
Application of sensitivity and uncertainty methodology to fast reactor integral experiment analysis, 3:44737
REACTOR KINETICS/NEUTRON TRANSPORT THEORY
Transport and reactor theory. Progress report, January 1-March 31, 1978, 3:44734 (LA-7271-PR)
REACTOR KINETICS EQUATIONS/NUMERICAL SOLUTION
Analysis of the eigenvalue equations in k, λ, γ, and α applied to some fast- and thermal-neutron systems, 3:44736
Higher order prompt-jump approximation in reactor kinetics, 3:44735
REACTOR LATTICES/NEUTRON TRANSPORT THEORY
Data preparation for calculations with the Monte-Carlo method on the base of the 26-group constant system, 3:44733 (IAE-2526)
REACTOR LICENSING
Power Reactor Docket Information, 3:44713 (NUREG/PRDI-78/6)
United States Nuclear Regulatory Commission Staff Practice and Procedure Digest. Supplement 3 to Digest No. 1, 3:44709 (NUREG-0386(Suppl.3))
REACTOR NOISE/DATA ANALYSIS
Multilevel crossing rates for automated signal classification, 3:44732 (CONF-780403-3)
REACTOR SAFETY
(Theoretical and experimental investigations of the behavior of reactor types and designs under various real or hypothetical accidents.)
Safety of CANDU reactors, 3:44794 (AECL-5800)
REACTOR SAFETY/BIBLIOGRAPHIES
Reactor safety: a literature search, 3:44814 (TID-3525-R5-S11)
REACTOR SAFETY/RESEARCH PROGRAMS
Project 'HDR safety programme'. A survey, 3:44826
REACTOR SIMULATORS
Performance measurement system for training simulators. Interim report, 3:44773 (EPRI-NP-783)
REACTOR VESSELS/FRACTURE PROPERTIES
Brittleness. Presupposition (criteria) for reactor vessel brittle fracture, 3:44746 (IAEA-18; CONF-751268-)
REACTORS
See also BREEDER REACTORS
HEAVY WATER MODERATED REACTORS
POWER REACTORS
WATER COOLED REACTORS
REACTORS/BIOLOGICAL SHIELDING
Fresh concrete control in situ of biological shields of nuclear reactors, 3:44768
REACTORS/RADIATION ACCIDENTS
Quarterly statement on incidents at nuclear installations, 3:44270
Quarterly statement on incidents at nuclear installations, second quarter 1977, 3:44269
Quarterly statement on incidents at nuclear installations, third quarter 1977, 3:44268
REACTORS/SHIELDING
Exponential supplementary equations for S/sub N/ methods: the two-dimensional case, 3:44740
Intercomparison of Monte Carlo calculations and measurements of the neutron and gamma-ray-streaming in multi bent ducts, 3:44741
Removal diffusion theory for calculating the effectiveness of neutron and gamma-ray shields for nuclear reactors and chemical plants, 3:44766
Secondary gamma radiation study in reactor shielding, 3:44769
READOUT SYSTEMS/DESIGN
Automatic range selector (Patent), 3:45276
RECYCLE (FUEL)
See FUEL CYCLE
REDOX FUEL CELLS/SIMULATION
Redox bulk energy storage system study. Volume 1. Final report, 18 February 1976-30 January 1977, 3:44908 (N-77-33608)
Redox bulk energy storage system study. Volume 2. Final report, 18 February 1976-30 January 1977, 3:44909 (N-77-33609)
REFLECTORS (NEUTRON)
See NEUTRON REFLECTORS
REFORMER PROCESSES/CATALYSTS
Catalyst for the treatment of hydrocarbons with hydrogen and method for its preparation (Patent), 3:44169
REFRACTORIES/CRACKING
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
REFRACTORIES/MECHANICAL PROPERTIES
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
REFRACTORIES/STRESS ANALYSIS
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
REFRACTORIES/THERMAL STRESSES
Improvement of the mechanical reliability of monolithic refractory linings for coal gasification process vessels. Annual progress report, July 1976-June 1977, 3:44041 (FE-2218-11)
REFUSE
See SOLID WASTES
REGGE POLES/PARTICLE KINEMATICS
Processes with fermion exchange in nonabelian gauge theories, 3:45676
RELATIVISTIC PLASMA/COMPTON EFFECT
Effect of multiple Compton scatterings on an x-ray emission spectrum. Calculations by the Monte Carlo method, 3:45437
RELATIVITY THEORY
See also GENERAL RELATIVITY THEORY
RELATIVITY THEORY/QUANTUM ELECTRODYNAMICS
Quantum Electrodynamics Within the Framework of a New Four-Dimensional Symmetry, 3:45668
REM
See DOSE EQUIVALENTS
REMOTE HANDLING EQUIPMENT
Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub-7117/25)
REMOTE HANDLING EQUIPMENT/RESEARCH PROGRAMS
Remote maintenance development, July 1, 1976-June 30, 1977 (For New Waste Calcination Facility), 3:45148 (ICP-1143)
REMOTE VIEWING EQUIPMENT/RESEARCH PROGRAMS
Remote maintenance development, July 1, 1976-June 30, 1977 (For New Waste Calcination Facility), 3:45148 (ICP-1143)
RENEWABLE ENERGY SOURCES
See also BIOMASS
GEOTHERMAL ENERGY
SOLAR ENERGY
Energy forecasts with special concern of renewable energy sources, 3:44882
RENEWABLE ENERGY SOURCES/PLANNING
Possibilities and principal features of the use of renewable resources in the FRG, 3:44898
RESEARCH PROGRAMS/SOCIO-ECONOMIC FACTORS
Economic and social aspects of research and development, 3:44867
RESEARCH PROGRAMS/TECHNOLOGY TRANSFER
Managing the flow of technology: technology transfer and the dissemination of technological information within the R and D organization (Book), 3:44866
RESEARCH REACTORS
See also BER-2 REACTOR
CP-2 REACTOR
CP-3 REACTOR
FFTF REACTOR
HFR REACTOR
R-A REACTOR
STF REACTOR
RESEARCH REACTORS/SHIELDING
Shield design of a 100 MW(Th) Research Reactor, 3:44787
RESERVOIR ROCK
See also FRACTURED RESERVOIRS
RESERVOIR ROCK/ELECTRIC CONDUCTIVITY
Guanacaste Geothermal Project. Technical prefeasibility report. Annex C. Electric resistivity, 3:44581 (NP-23012)
RESERVOIR ROCK/SIMULATION
Gassim. user's description: a gas reservoir simulation model, 3:44192 (N-77-33467)
RESERVOIRS (WATER)
See WATER RESERVOIRS
RESIDENTIAL BUILDINGS/HEAT LOSSES
Effects of heat leaks on thermal insulation of domestic and industrial buildings, 3:44943
RESIDENTIAL BUILDINGS/SOLAR SPACE HEATING
Residential solar demonstration program of the U.S. Department of Housing and Urban Development, 3:44455

RESIDENTIAL BUILDINGS/SPACE HEATING
Annual heating energy demand of heavy domestic buildings. Report No. 16, 3:44940 (NP-23142)
RESIDENTIAL BUILDINGS/THERMAL INSULATION
Annual heating energy demand of heavy domestic buildings. Report No. 16, 3:44940 (NP-23142)
RESIDENTIAL BUILDINGS/VENTILATION SYSTEMS
Design of a mobile laboratory for ventilation studies and indoor air pollution monitoring, 3:44938 (LBL-7817)
RESIDENTIAL SECTOR/APPLIANCES
Electric Utility Rate Design Study: technology for utilizing off-peak energy, Topic 8, 3:44889 (NP-22552)
RESIDENTIAL SECTOR/ENERGY DEMAND
Analysis of the final energy demand in individual demand sectors and projection of its future development (German Federal Republic), 3:44881
RESIDUAL FUELS/DESULFURIZATION
Method to desulphurize heavy mineral oils (Patent), 3:44170
RESIDUAL OILS
See PETROLEUM RESIDUES
RESIDUES
See also ASHES
RESIDUES/PARTIAL OXIDATION PROCESSES
EDS coal liquefaction process development: Phase IIIA. Monthly technical progress report, May 1-May 31, 1977, 3:44067 (FE-2353-17)
RESIDUES (RADIOACTIVE)
See RADIOACTIVE WASTES
RESINS/REMOVAL
N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX-613-1955(Rev.))
RESOURCE CONSERVATION
Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report, 3:44860 (PB-274411)
Planning and the rural environment (Book), 3:44861
RESOURCE DEPLETION
Energy supplies: a look ahead, 3:44877
RESPIRATORS/PERFORMANCE TESTING
Respirator studies for the DOE Division of Operational and Environmental Safety. Progress report, October 1, 1976-September 30, 1977, 3:45147 (LA-6969-PR)
RESPIRATORY EQUIPMENT
See RESPIRATORS
RESPIRATORY SYSTEM DISEASES/EPIDEMIOLOGY
Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis, 3:45422 (PB-274339)
REVERSE-FIELD PINCH/ADIABATIC COMPRESSION HEATING
Theoretical studies of the formation and adiabatic compression of reversed-field configurations in imploding liners, 3:46098
REVERSE-FIELD PINCH/MAGNETIC FIELD CONFIGURATIONS
Evolution of the reversed-field pinch, 3:46099
Theoretical studies of the formation and adiabatic compression of reversed-field configurations in imploding liners, 3:46098
RHENIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
RHENIUM/DEFORMATION
Effect of plastic deformation on low-temperature specific heat and superconductivity of rhenium, 3:45041
RHENIUM/SPECIFIC HEAT
Effect of plastic deformation on low-temperature specific heat and superconductivity of rhenium, 3:45041
RHENIUM/TRANSITION TEMPERATURE
Effect of plastic deformation on low-temperature specific heat and superconductivity of rhenium, 3:45041
RHENIUM OXIDES/ENERGY SPECTRA
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
RHENIUM OXIDES/OPTICAL PROPERTIES
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
RHO-765 RESONANCES/PARTICLE PRODUCTION
Meson production by Δ exchange in π^- p interactions at 4 GeV/c, 3:45581
RHODANATES
See THIOCYANATES
RHODANIDES
See THIOCYANATES
RHODIUM/CATALYTIC EFFECTS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
RHR SYSTEMS
(Residual heat removal.)
RHR SYSTEMS/FAILURE MODE ANALYSIS
Failure Modes and Effects Analysis (FMEA) of the Residual Heat Removal System (PWR), 3:44650 (WCAP-8967)
RIBONUCLEIC ACID
See RNA
RICHLAND FFTF REACTOR
See FFTF REACTOR
RICHLAND NPR REACTOR
See N-REACTOR
RIEMANN WAVES
See SHOCK WAVES
RINGS (STORAGE)
See STORAGE RINGS
RIO BLANCO EVENT/LAND RECLAMATION
Rio Blanco radiation contamination clearance report, 3:45285 (PNE-RB-79)
RISER CRACKING
See COAL LIQUEFACTION
RIVERS
See also STREAMS
TENNESSEE RIVER
RIVERS/POLLUTION
Field observations on the transport of heavy metals in sediments, 3:45343
RIVERS/THERMAL POLLUTION
Supplement to effects of thermal discharges on physico-chemical processes and water quality, Vistula River, Poland. Final report, January 1973-December 1975, 3:45361 (PB-273580)
RNA
(Ribonucleic acid.)
See also MESSENGER-RNA
RNA/SEPARATION PROCESSES
Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer, 3:45375 (UR-3490-1379)
ROADS/DYNAMIC LOADS
Measurement of elastic strain in granular material, 3:45234
ROADS/MAINTENANCE
Financing public expenditures for energy-impacted roads, 3:44125 (PB-274405)
ROADS/SEISMIC EFFECTS
Measurement of elastic strain in granular material, 3:45234
ROCK DRILLING
See also DRILLS
ROCK DRILLING/NOISE POLLUTION CONTROL
Design of a quiet rock drill. A feasibility study using principles of leavell pavement breaker. Final report, 3:44099 (PB-274402)
ROCKET REACTOR EXPERIMENTAL ROVER
See ROVER REACTORS
ROCKS
See also RESERVOIR ROCK
SEDIMENTARY ROCKS
ROCKS/HYDROTHERMAL ALTERATION
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP-22850)
ROCKS/SENSIBLE HEAT STORAGE
Some experimental data for thermal pile energy storage, 3:44560 (CONF-761220-)
ROENTGEN EQUIVALENT MAN
See DOSE EQUIVALENTS
ROOM AND PILLAR MINING/VENTILATION
Evaluation of the use of air curtains to increase face ventilation. Final report, April 1975-March 1977, 3:44096 (PB-274324)
ROVER REACTORS/FUEL CYCLE
Pilot-plant development of a Rover waste calcination flowsheet, 3:44280 (ICP-1148)
RUBIDIUM/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
RUBIDIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
RUBIDIUM/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
RUBIDIUM 82/RADIONUCLIDE KINETICS
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
RUNAWAY ELECTRONS/BUMP-IN-TAIL INSTABILITY
Runaway electrons in collective electric fields, 3:45956

RUNAWAY ELECTRONS/ELECTRIC FIELDS
Runaway electrons in collective electric fields, 3:45956
RUNAWAY ELECTRONS/KINETIC EQUATIONS
Kinetic theory of runaway electron beam instability in a tokamak, 3:46010
RUNAWAY (REACTOR ACCIDENT)
See EXCURSIONS
RUNGE-KUTTA METHOD/COMPUTER CALCULATIONS
Storage reduction for Runge-Kutta codes, 3:46140 (SAND-78-0909)
RURAL AREAS/ENVIRONMENT
Planning and the rural environment (Book), 3:44861
RURAL AREAS/PLANNING
Planning and the rural environment (Book), 3:44861
RUTHENIUM/CATALYTIC EFFECTS
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977 (Ni, Ni-Co, Ni-MoO_3, Ni-Pt, Ni-Rh and Ni-Ru), 3:44048 (FE-2729-1)
RUTHENIUM 103/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
RUTHENIUM 105/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
RUTHENIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
RWE-BAYERNWERK REACTOR/ELECTRICAL INSULATORS
Grundremmingen nuclear power plant: The accident that came from the cold, 3:44825
RWE-BAYERNWERK REACTOR/REACTOR ACCIDENTS
Grundremmingen nuclear power plant: The accident that came from the cold, 3:44825

S

S WAVES (SEISMIC)
See SEISMIC S WAVES
SACCHAROMYCES CEREVISIAE/GENE MUTATIONS
Chromosomal translocation causing overproduction of iso-2-cytochrome c in yeast, 3:45373
SAFEGUARDS
See also IAEA SAFEGUARDS
PHYSICAL PROTECTION DEVICES
Annual report of the Nuclear Safeguards Project 1976 (Karlsruhe), 3:44307 (KFK-2465)
Overview of the M.A.I.T. analysis system (machine analysis of the internal threat) (Collusion and illicit use of access), 3:44314 (UCRL-81005)
Supervision of fissionable fuel in non-proliferation, 3:44315 (ORNL-tr-4621)
SAFEGUARDS/PHYSICAL PROTECTION DEVICES
Systematic approach to the conceptual design of physical protection systems for nuclear facilities, 3:44306 (HCP/D0789-01)
SAFEGUARDS/SYSTEMS ANALYSIS
Evaluation methodology based on physical security assessment results: a utility theory approach, 3:44313 (SAND-78-0377)
SAFEGUARDS/VULNERABILITY
Capability for intrusion detection at nuclear fuel sites, 3:44309 (NUREG/CR-0027)
SAFETY (NUCLEAR)
See RADIATION PROTECTION
SAFETY TEST FACILITY REACTOR
See STF REACTOR
SALINITY/BIOLOGICAL EFFECTS
Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to Gambusia affinis. Final report, 3:44593 (UCRL-13832)
SALTON SEA GEOTHERMAL FIELD/ENVIRONMENTAL IMPACTS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
SALTON SEA GEOTHERMAL FIELD/GEOTHERMAL POWER PLANTS
Economic assessment of polymer concrete usage in geothermal power plants, 3:44597 (BNL-50777)
SAMARIUM 144 TARGET/KRYPTON 86 REACTIONS
Gamma-ray multiplicity moments from deeply inelastic collisions of ^{86}Kr and ^{144}Sm, 3:45745
SAMARIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
SAMARIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
SANDSTONES/MICROSTRUCTURE
Microcracks and matrix deformation in stressed gas-bearing sandstones, 3:44193 (UCRL-80328)
SCALE INVARIANCE/SYMMETRY BREAKING
Spontaneous breaking of scale invariance in gauge theories, 3:45652
SCANDIUM/THERMAL EXPANSION
Temperature dependence of the anisotropy of thermal expansion of scandium, 3:45039
SCANDIUM 46/ENERGY LEVELS
Nuclear data sheets for A=46, 3:45723
SCANDIUM 46/ENERGY-LEVEL TRANSITIONS
Nuclear data sheets for A=46, 3:45723
SCANDIUM ALLOYS/SPECIFIC HEAT
Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys, 3:45028
SCANDIUM ALLOYS/SUPERCONDUCTIVITY
Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys, 3:45028
SCANDIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
SCANDIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
SCANNERS (IMAGE)
See IMAGE SCANNERS
SCANNING (RADIOISOTOPE)
See RADIOISOTOPE SCANNING
SCATTERING/INTEGRAL EQUATIONS
Integral equations of scattering theory and the strong-coupling method, 3:45803
SCAVENGING
Use of synthetic scavengers for the binding of heavy metals (Mercury), 3:45355
SCHOOL BUILDINGS/ENERGY CONSERVATION
Report on the development of a model energy conservation program for New York State schools. Report on phase 1, January-July 77, 3:44948 (PB-274285)
SCHOOL BUILDINGS/PASSIVE SOLAR HEATING SYSTEMS
Suntrap insolator/insulator possible application to walls and roofs of schools, 3:44405 (CONF-761220-)
SCHOOL BUILDINGS/SOLAR AIR CONDITIONING
Solar air conditioning for a school in Dade County, Florida, 3:44427 (CONF-761220-)
SCHOOL BUILDINGS/SOLAR COOLING SYSTEMS
Solar heating and cooling of buildings in Greece with special reference to schools, 3:44407 (CONF-761220-)
SCHOOL BUILDINGS/SOLAR HEATING SYSTEMS
Microprocessor instrumentation and control of the University of Louisville's Dual Solar Energy Research Center, 3:44437 (CONF-761220-)
Solar energy system of the Institute of Molecular Biology, Salzburg of the Austrian Academy of Science, 3:44418 (CONF-761220-)
Solar heating and cooling of buildings in Greece with special reference to schools, 3:44407 (CONF-761220-)
Solar heating system for recreation building at Scattergood School, 3:44440 (DOE/NASA/CR-150553)
University of Louisville Dual Solar Energy Research Center, 3:44412 (CONF-761220-)
SCHOOL BUILDINGS/SOLAR WATER HEATERS
Control and optimization of solar water heating systems in univeristy buildings, 3:44462 (CONF-761220-)
SCHOOL BUILDINGS/SOLAR WATER HEATING
Solar heating system for recreation building at Scattergood School, 3:44440 (DOE/NASA/CR-150553)
SCHOTTKY BARRIER DIODES/ENERGY LEVELS
Diamond-metal interfaces and the theory of Schottky barriers, 3:45836
SCHOTTKY BARRIER DIODES/FAR INFRARED RADIATION
Far-ir heterodyne radiometric measurements with quasioptical Schottky diode mixers, 3:45907
SCHROEDINGER EQUATION/ANALYTICAL SOLUTION
Exact wave-function normalization constants for the B_0 tanhz-U_0 cosh^{-} 2z and Poeschl-Teller potentials, 3:45498
SCHROEDINGER EQUATION/NUMERICAL SOLUTION
New numerical methods applied to solving the one-dimensional eigenvalue problem. Interim report, 3:45852 (AD-A-048446)

SCHWINGER SOURCE THEORY/BAG MODEL
Vacuum degeneracy and confinement in the massive Schwinger model, 3:45657
SCHWINGER SOURCE THEORY/VACUUM STATES
Vacuum degeneracy and confinement in the massive Schwinger model, 3:45657
SCINTIGRAPHY
See SCINTISCANNING
SCINTILLATION COUNTERS
See also SOLID SCINTILLATION DETECTORS
SCINTILLATION COUNTERS/COUNTING CIRCUITS
Nuclear radiation measuring method and apparatus having blanking time inversely related to count rate (Patent; for inhibiting measurement during excessive background counts), 3:45259
SCINTISCANNING/COMPARATIVE EVALUATIONS
Some performance and design characteristics of PETT III, 3:45383
SCREENS/TECHNOLOGY ASSESSMENT
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
SCREW PINCH/MAGNETIC FIELD CONFIGURATIONS
Numerical computation of high-beta toroidal diffuse equilibria, 3:46100
SCRUBBERS/ENERGY CONSUMPTION
Coal utilization and conversion technologies: state-of-the-art (California; more than 100 references), 3:44135 (NP-23211)
SCRUBBERS/PERFORMANCE TESTING
EPA alkali scrubbing test facility: advanced program. Progress report No. 3, February-November 1976, 3:44625 (PB-274544)
SCYLLAC DEVICES/REVIEWS
Summary of Syllac results, 3:46082 (LA-7125-MS)
SEALS/PERFORMANCE TESTING
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978 (LMFBR), 3:44685 (AI-DOE-13231)
SEAS
See also ATLANTIC OCEAN
PACIFIC OCEAN
SEAS/POLLUTION
Global environment, 3:45329 (NP-23191)
SEAWATER/QUARKS
Search for fractionally charged particles in sea water, ocean sediment deposits, and volcanic lava, 3:45557
SEAWATER/SOLAR DISTILLATION
Solar MSF sea water desalination plant, 3:44354
Solar powered gas generation (Patent; combined solar thermal power plant for electrolysis of seawater and solar still), 3:44399
SECURITY/SYSTEMS ANALYSIS
Evaluation methodology based on physical security assessment results: a utility theory approach, 3:44313 (SAND-78-0377)
SEDIMENTARY ROCKS
See also LIMESTONE
SEDIMENTARY ROCKS/DIAGENESIS
Experimental diagenetic study of a modern lipid-rich sediment, 3:44146
SEDIMENTARY ROCKS/INCLUSIONS
Stable carbon isotope ratios and chemical properties of kerogen and extractable organic matter in prephanerozoic and phanerozoic sediments: their interrelations and possible paleobiological significance, 3:44209
SEDIMENTARY ROCKS/PETROLEUM
Individual components of low-boiling (up to 125°C) hydrocarbons in organic matter of sedimentary rocks (Comparison of chemical composition of petroleum and organic matter of rocks), 3:45435
SEDIMENTS
Contribution of chronic petroleum inputs to Narragansett Bay and Rhode Island Sound sediments, 3:45335
Distribution and abundance of hydrocarbon-utilizing bacteria in sediments of Chedabucto Bay, Nova Scotia, in 1976, 3:45408
Weathering characteristics of petroleum hydrocarbons deposited in fine clay marine sediments, Searsport, Maine, 3:45333
SEDIMENTS/CHEMICAL ANALYSIS
Mercury distribution in the Chesapeake Bay, 3:45350
Recruitment of benthic animals as a function of petroleum hydrocarbon concentrations in the sediment, 3:45106
SEDIMENTS/GEOCHEMICAL SURVEYS
Multilaboratory analytical quality control for the hydrochemical and stream sediment reconnaissance (National Uranium Resource Evaluation (NURE)), 3:44213 (IS-4370)
SEDIMENTS/POLLUTION
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
Field observations on the transport of heavy metals in sediments, 3:45343
SEDIMENTS/QUARKS
Search for fractionally charged particles in sea water, ocean sediment deposits, and volcanic lava, 3:45557
SEDIMENTS/RADIOACTIVITY
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
SEEDS/SOLAR DRYING
Solar grain drying, 3:44460
SEISMIC DETECTION/DATA ANALYSIS
Investigation of small earthquakes in Southwestern Turkmenia, 3:45430 (UCRL-Trans-11363)
Method of isosurfaces in the interpretation of local earthquakes, 3:45431 (UCRL-Trans-11364)
SEISMIC P WAVES/VELOCITY
Crustal thickness in the island region of the Soviet Far East, 3:45428 (UCRL-Trans-11367)
Travel time curves of seismic waves for the southern Baikal region, 3:45429 (UCRL-Trans-11368)
SEISMIC S WAVES
See also EARTHQUAKES
SEISMIC DETECTION
SEISMIC SURVEYS
UNDERGROUND EXPLOSIONS
SEISMIC S WAVES/VELOCITY
Crustal thickness in the island region of the Soviet Far East, 3:45428 (UCRL-Trans-11367)
Travel time curves of seismic waves for the southern Baikal region, 3:45429 (UCRL-Trans-11368)
SEISMIC SURVEYS/TECHNOLOGY ASSESSMENT
Assessment of surface geophysical methods in geothermal exploration and recommendations for future research, 3:44579 (LBL-6815)
SELENIUM/BIOLOGICAL EFFECTS
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
SELENIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
SELENIUM/MAXIMUM PERMISSIBLE CONCENTRATION
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
SELENIUM 72/ENERGY-LEVEL TRANSITIONS
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
SELENIUM 72/HIGH SPIN STATES
Recoil distance lifetime measurements in ^{69}As and ^{72}Se, 3:45726
SELENIUM 77/ACTIVATION ANALYSIS
Measuring system for fast neutron activation analysis at the BER-II reactor. Development and first applications, 3:45108 (HMI-B-188)
SELF-POWERED NEUTRON DETECTORS/DESIGN
Gamma compensated, self powered neutron detector (Patent), 3:45261
SELNI REACTOR/SPENT FUEL ELEMENTS
Post irradiation examination of the fuel discharged from the Trino Vercellese reactor after the 2nd irradiation cycle, 3:44648 (EUR-5605)
SEMICONDUCTOR LASERS/EMISSION SPECTRA
Laser Pb/sub 1hyphenx/Sn/sub x/Te heterostructures, 3:45186
SEMICONDUCTOR LASERS/PHYSICAL RADIATION EFFECTS
Effects of gamma radiation on gallium-arsenide lasers. Master's thesis, 3:45156 (AD-A-048361)
SEMICONDUCTOR LASERS/THRESHOLD ENERGY
Low-threshold laser with In-Ga-As-P heterostructure, 3:45194
SEMICONDUCTOR MATERIALS
(See also specific semiconductor materials.)
SEMICONDUCTOR MATERIALS/HOLES
Hydrodynamic approach to electron-hole droplet nucleation and stability, 3:45835
SEMICONDUCTOR MATERIALS/HYDRODYNAMIC MODEL
Hydrodynamic approach to electron-hole droplet nucleation and stability, 3:45835
SENA REACTOR
See ARDENNES REACTOR
SENN REACTOR
See GARIGLIANO REACTOR
SENSIBLE HEAT STORAGE
Some experimental data for thermal pile energy storage, 3:44560 (CONF-761220-)
SENSIBLE HEAT STORAGE/DESIGN
Thermal distribution and storage system for solar and other heating and cooling (Patent), 3:44841
SENSIBLE HEAT STORAGE/HEAT TRANSFER
Long duration earth storage of solar energy, 3:44561 (CONF-761220-)

SENSIBLE HEAT STORAGE/UNDERGROUND STORAGE
Geothermal storage of solar energy for electric power systems, 3:44558 (CONF-761220-)
SEWAGE
See LIQUID WASTES
SEWAGE SLUDGE/WASTE PROCESSING
Hygienization of sewage sludge by electron irradiation, 3:44968
SEWAGE TREATMENT
See WASTE PROCESSING
SGHWR REACTOR/SHIELDING
Methods of calculation used in the design of the shielding within the primary containment of a commercial S.G.H.W.R., 3:44684
SHALE GAS/PRODUCTION
Process for obtaining oil, gas, sulfur, and other products from oil shale (Patent), 3:44206
SHALE OIL/CATALYTIC CRACKING
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1977, 3:44065 (FE-2315-19)
SHALE OIL/FRACTIONATION
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1977, 3:44065 (FE-2315-19)
SHALE OIL/HYDROGENATION
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1977, 3:44065 (FE-2315-19)
SHALE OIL/PRODUCTION
Process for obtaining oil, gas, sulfur, and other products from oil shale (Patent), 3:44206
SHALE OIL/REFINING
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1977, 3:44065 (FE-2315-19)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, October-December 1977, 3:44208 (FE-2315-22)
Refining of shale oil, 3:44207 (BERC/IC-77/3)
SHALE OIL/TECHNOLOGY ASSESSMENT
Refining of shale oil, 3:44207 (BERC/IC-77/3)
SHEAR WAVES
See SEISMIC S WAVES
SHEARER LOADERS
See CUTTER LOADERS
SHEATHS (FUEL)
See FUEL CANS
SHELL MODELS
Reaction valleys: mechanism of interaction of complex nuclei studied on the basis of the two-center shell model, 3:45809
SHELL MODELS/PHOTONUCLEAR REACTIONS
Photoneutron reactions near threshold and the optical model of nuclei, 3:45805
SHELL MODELS/REVIEWS
Method of K harmonics and the shell model, 3:45811
SHELL MODELS/SU-3 GROUPS
Note on recoupling coefficients for SU(3), 3:45810
SHELLS/LASER IMPLOSIONS
Self-similar snowplow plasma flows, 3:45963
SHELLS/RAYLEIGH-TAYLOR INSTABILITY
Breakup of an accelerated shell owing to Rayleigh-Taylor instability, 3:45832 (LA-7291-MS)
SHELLS (CONTAINMENT)
See CONTAINMENT SHELLS
SHIELDING
See also BIOLOGICAL SHIELDING
Optimisation of shielding for direct-cycle steam turbine plant, 3:44765
SHIELDING/DESIGN
UK fast reactor shield design and performance, 3:44706
SHIELDING/GAMMA SPECTRA
Secondary gamma radiation study in reactor shielding, 3:44769
SHIELDING/NEUTRON SPECTRA
Integral data for the prediction of neutron propagation in iron-sodium mixtures, 3:44705
Results of neutron propagation in steel sodium mixtures with various source spectra on Harmonie and Tapiro, 3:44704
Two-dimensional shielding benchmarks for sodium and iron at Yayoi, 3:44707
SHIELDING/NEUTRON TRANSPORT
Coarse mesh algorithm to solve neutron transport equation in thick shields, 3:44767
Exponential supplementary equations for S/sub N/ methods: the two-dimensional case, 3:44740
Generation and testing of the shielding data library EURLIB for fission and fusion technology, 3:45817
Removal diffusion theory for calculating the effectiveness of neutron and gamma-ray shields for nuclear reactors and chemical plants, 3:44766
SHIELDING/NUCLEAR DATA COLLECTIONS
Generation and testing of the shielding data library EURLIB for fission and fusion technology, 3:45817
SHIELDING/PHOTON TRANSPORT
Removal diffusion theory for calculating the effectiveness of neutron and gamma-ray shields for nuclear reactors and chemical plants, 3:44766
SHIELDING/RADIATION STREAMING
Development of a computer code for neutron streaming calculation in LMFBR (MADONNA code), 3:44703
Intercomparison of Monte Carlo calculations and measurements of the neutron and gamma-ray-streaming in multi bent ducts, 3:44741
Simple albedo method for calculating effects of single-legged ducts (GRID code), 3:44739
Study of applicability of an albedo Monte Carlo method for neutron streaming calculation (LMFBR), 3:44702
SHIP REACTOR MUTSU
See MUTSU REACTOR
SHIPS/FUEL ECONOMY
Maritime fuel conservation, 3:44953 (PB-275722)
SHOCK ABSORBERS/PERFORMANCE TESTING
Proof test of the ATLAS Trailer Shock Isolation System, 3:45284 (UCRL-50016-78-1)
SHOCK HEATING
Thermonuclear reaction wave in high-density plasma, 3:45899
SHOCK HEATING/MAGNETIC COMPRESSION
Ion heating and fine structure of the potential in the interaction of a magnetic piston with a plasma, 3:45896
SHOCK WAVES/WAVE PROPAGATION
Development of an artificial viscosity function. Final report, 3:45283 (AD-A-048778)
SHROUDS
(Cover enveloping the active length of a fuel assembly, to stabilize the coolant flow through the assembly.)
SHROUDS/STRESS ANALYSIS
Computation of the weight function from a stress intensity factor (LMFBR), 3:44686 (ANL-77-82)
SI SEMICONDUCTOR DETECTORS/CHARGED-PARTICLE TRANSPORT
Ionization energy loss of relativistic electrons in thin silicon detectors, 3:45266
SID
See SUDDEN IONOSPHERIC DISTURBANCE
SIGMA MINUS/LEPTONIC DECAY
Measurement of $\Sigma^- \rightarrow \Lambda e^- \bar{\nu}$ and $\Xi^- \rightarrow \Lambda e^- \bar{\nu}$ branching ratios, 3:45568
SILICA/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
SILICA/LEACHING
Chemical durability of glasses suitable for the storage of high level radioactive wastes. I. On the mechanism of dissolution of the glasses of borax-alumina-silica system in water (Borax-alumina-silica), 3:44300 (ORNL-tr-4626)
SILICA/STABILITY
Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system (SiO_2-B_2O_3-Na_2O-CaO-Al_2O_3-Fe_2O_3), 3:44299 (ORNL-tr-4632)
SILICATES/BIOLOGICAL REGENERATION
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)
SILICON/ANNEALING
Laser annealing of diffusion-induced imperfections in silicon, 3:45087
SILICON/CHEMICAL VAPOR DEPOSITION
Laboratory studies of silicon vapor deposition, Phase A. Final report, 3:44359 (N-77-33296)
SILICON/CRYSTAL DOPING
p-n junction formation in boron-deposited silicon by laser-induced diffusion, 3:44362
SILICON/CRYSTAL GROWTH
Large area silicon sheet by EFG. Fourth quarterly report, October 1, 1977-December 31, 1977, 3:44356 (DOE/JPL/954355-4)
SILICON/PHOTOVOLTAIC EFFECT
Comparison of carrier lifetime measurements by photoconductive decay and surface photovoltage methods, 3:44369
SILICON/PHYSICAL RADIATION EFFECTS
Comparative study of laser and thermal annealing of boron-implanted silicon, 3:45102
Role of stresses in annealing of ion-implantation damage in Si, 3:45100

Zero-bias resistance of grain boundaries in neutron-transmutation-doped polycrystalline silicon, 3:45101
SILICON/PION MINUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
SILICON/PION PLUS REACTIONS
Elastic scattering of 162-MeV pions by nuclei, 3:45700
SILICON/PRODUCTION
Low Cost Silicon Solar Array Project, Silicon Materials Task. Development of a process for high capacity arc heater production of silicon for solar arrays. Quarterly technical report, July-September 1977, 3:44357 (DOE/JPL/954589-3)
SILICON/SOLIDIFICATION
Theoretical analysis of heat flow in horizontal ribbon growth from a melt, 3:45864
SILICON 28/RANGE
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
SILICON 28/STOPPING POWER
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
SILICON 28 TARGET/PHOTONUCLEAR REACTIONS
Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV, 3:45563
SILICON ALLOYS/CORROSION RESISTANCE
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June-31 August 1977, 3:45053 (FE-2299-15)
SILICON ALLOYS/FABRICATION
Production of aluminum-silicon alloy and ferrosilicon and commercial purity aluminum by the direct reduction process. First quarterly progress report, 1 September 1977-30 November 1977, 3:45003 (TID-28260)
SILICON CARBIDES/MATERIALS TESTING
Assessment of carbon and silicon carbide as first wall materials in inertial confinement fusion reactors, 3:46127 (UCRL-13801)
SILICON CARBIDES/TENSILE PROPERTIES
Weibull characterization for tensile fracture of multicomponent brittle fibers, 3:45067 (N-77-33929)
SILICON CHLORIDES/PRODUCTION
Low Cost Silicon Solar Array Project, Silicon Materials Task. Development of a process for high capacity arc heater production of silicon for solar arrays. Quarterly technical report, July-September 1977, 3:44357 (DOE/JPL/954589-3)
SILICON COMPOUNDS/ELECTRON MOBILITY
Correspondence of conduction band minima and electron mobility maxima in dielectric liquids, 3:44999
SILICON OXIDES/RADIATION SCATTERING ANALYSIS
Reduction in the error of determining the ash content of coal by the radioisotope method, 3:44081
SILICON SOLAR CELLS/ANTIREFLECTION COATINGS
Anti-reflective coating for silicon solar cells (Patent), 3:44372
SILICON SOLAR CELLS/DESIGN
Radiation hardened P-I-N and N-I-P solar cells (Patent), 3:44375
SILICON SOLAR CELLS/ECONOMIC ANALYSIS
Large area silicon sheet by EFG. Fourth quarterly report, October 1, 1977-December 31, 1977, 3:44356 (DOE/JPL/954355-4)
Phase 2, automated array assembly, Task IV, Low Cost Silicon Solar Array Project. Quarterly report No. 1, November 1, 1977-January 28, 1978, 3:44358 (DOE/JPL/954898-1)
SILICON SOLAR CELLS/ELECTRICAL PROPERTIES
Electrical 2-omega-cm 0.046-cm-thick silicon solar cells as a function of intensity and temperature, 3:44360 (N-77-33604)
SILICON SOLAR CELLS/FABRICATION
Large area silicon sheet by EFG. Fourth quarterly report, October 1, 1977-December 31, 1977, 3:44356 (DOE/JPL/954355-4)
Method of forming silicon solar energy cell having improved back contact (Patent), 3:44378
Semiconductor solar energy device (Patent), 3:44377
Solar cell made of semiconductor material, with method of production (Patent), 3:44383
SILICON SOLAR CELLS/PRODUCTION
Phase 2, automated array assembly, Task IV, Low Cost Silicon Solar Array Project. Quarterly report No. 1, November 1, 1977-January 28, 1978, 3:44358 (DOE/JPL/954898-1)
Solar cell and method of production (Patent), 3:44382
SILICON SOLAR CELLS/RADIATION HARDENING
Radiation hardened P-I-N and N-I-P solar cells (Patent), 3:44375
SILICON SOLAR CELLS/SURFACE COATING
Optical performance of absorber-reflector combinations for photothermal solar energy conversion, 3:44374
SILICONES/CHEMICAL PROPERTIES
The chemistry of silicone resins (a bibliography with abstracts). Report for 1964-January 1978, 3:45126 (NTIS/PS-78/0050)
SILICONES/CHEMICAL RADIATION EFFECTS
The chemistry of silicone resins (a bibliography with abstracts). Report for 1964-January 1978, 3:45126 (NTIS/PS-78/0050)
SILICONES/SYNTHESIS
The chemistry of silicone resins (a bibliography with abstracts). Report for 1964-January 1978, 3:45126 (NTIS/PS-78/0050)
SILT/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
SILVER/ALPHA REACTIONS
Correlated energy spectra of light fragments from 720-MeV α-induced reactions, 3:45715
SILVER/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
SILVER/CHARGED-PARTICLE TRANSPORT
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
SILVER 105/ENERGY LEVELS
Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag, 3:45744
SILVER 105/ENERGY-LEVEL TRANSITIONS
Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag, 3:45744
SILVER 106/ENERGY LEVELS
Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag, 3:45744
SILVER 106/ENERGY-LEVEL TRANSITIONS
Gamma radiation from the reaction ^{105}Pd(p,nγ)^{105}Ag, 3:45744
SILVER 107 TARGET/CARBON 12 REACTIONS
Dynamics of collision of fast nuclei ($E \sim 200$ MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
SILVER 108 TARGET/PROTON REACTIONS
Energy spectra of nuclear fragments produced by high energy protons, 3:45707
SILVER 109 TARGET/ARGON 40 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
SILVER 122/BETA-MINUS DECAY
Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{122}Ag, 3:45739
SILVER BROMIDES/ALPHA REACTIONS
Central collisions produced by relativistic heavy ions in nuclear emulsion, 3:45572
SILVER BROMIDES/ARGON 40 REACTIONS
Central collisions produced by relativistic heavy ions in nuclear emulsion, 3:45572
SILVER BROMIDES/OXYGEN 16 REACTIONS
Central collisions produced by relativistic heavy ions in nuclear emulsion, 3:45572
SILVER IODIDES/DIFFUSION
Ionic motion in α-AgI, 3:45094
SINGLE CELL PROTEIN/BIOSYNTHESIS
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
SKIN DISEASES/RADIOTHERAPY
Review of the use of ionizing radiation for the treatment of benign diseases. Volume I. Committee's report. Final report, 3:45380 (PB-274032)
SLABS/PHOTON TRANSPORT
Theory and use of Maniscalco two-medium buildup factors, 3:45815
SLAGS/NUCLEATION
Nucleation and evolution of slag droplets in coal combustion, 3:44132 (CONF-780307-8)
SLAGS/SELF-DIFFUSION
Self diffusion of calcium ions in soda lime and slag glasses, 3:45120 (ORNL-tr-4627)
SLAGS/VISCOSITY
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
SLUGS (FUEL)
See FUEL RODS
SMELTING/ENVIRONMENTAL EFFECTS
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
SMOG/PHOTOCHEMICAL REACTIONS
Measurement of rate constants of importance in smog. Final report, April 1973-July 1977, 3:45298 (PB-274530)
SNG PLANTS/ENVIRONMENTAL IMPACT STATEMENTS
Draft environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company, 3:44329 (DES-77-1)

Final environmental impact statement on the Federal Energy Administration's proposed action to allocate naphtha for SNG production by the Indiana Gas Company, 3:44330 (FES-77-1)
SNG PROCESSES
Process for production of gas rich in methane which can be exchanged for natural gas (Patent), 3:44335
SNOW/MELTING
Simulation of the solar assisted heating and snow-melting system of a commercial bank building in Buffalo, New York, 3:44465 (CONF-761220-)
SODA ASH
See SODIUM CARBONATES
SODIUM/ATOM-MOLECULE COLLISIONS
Collisional ionization between alkali atoms and some methane derivatives: Electron affinities for CH_3NO_2, CF_3I, and CF_3Br, 3:45527
SODIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
SODIUM/NEUTRON SPECTRA
Integral data for the prediction of neutron propagation in iron-sodium mixtures, 3:44705
Results of neutron propagation in steel sodium mixtures with various source spectra on Harmonie and Tapiro, 3:44704
Two-dimensional shielding benchmarks for sodium and iron at Yayoi, 3:44707
SODIUM/NEUTRON TRANSPORT
Coarse mesh algorithm to solve neutron transport equation in thick shields, 3:44767
Sensitivity analysis for shielding data evaluation by interactive graphics computing, 3:45823
SODIUM/REMOVAL
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978 (LMFBR), 3:44685 (AI-DOE-13231)
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
SODIUM 23/RANGE
Ranges of projectiles with $8<$ or $=Z<$ or $=20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
SODIUM 23/STOPPING POWER
Ranges of projectiles with $8<$ or $=Z<$ or $=20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
SODIUM CARBONATES/CHEMICAL REACTIONS
Action of aqueous alkali on pyrite (Ph.D. dissertation), 3:44030 (IS-ICP-51)
SODIUM CARBONATES/LATENT HEAT STORAGE
Development of latent heat of fusion type materials, 3:44562 (CONF-761220-)
SODIUM CHLORIDES/ABUNDANCE
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP-23013)
SODIUM CHLORIDES/EVAPORATION
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
SODIUM HYDROXIDES/CHEMICAL REACTIONS
Action of aqueous alkali on pyrite (Ph.D. dissertation), 3:44030 (IS-ICP-51)
SODIUM OXIDES/STABILITY
Chemical durability of glasses suitable for the storage of high level radioactive wastes. II. On the continuous leach method for the low temperature melting glasses of borosilicate system (SiO_2-B_2O_3-Na_2O-CaO-Al_2O_3-Fe_2O_3), 3:44299 (ORNL-tr-4632)
SODIUM PHOSPHATES/LATENT HEAT STORAGE
Development of latent heat of fusion type materials, 3:44562 (CONF-761220-)
SODIUM SULFATES/LATENT HEAT STORAGE
Development of latent heat of fusion type materials, 3:44562 (CONF-761220-)
SOILS/CONTAMINATION
Laboratory research on tailings stabilization methods and their effectiveness in radiation containment (Uranium, reduction of radon exhalation), 3:45314 (GJT-21)
SOILS/HEAT TRANSFER
Long duration earth storage of solar energy, 3:44561 (CONF-761220-)
SOILS/POLLUTION
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
SOILS/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
SOILS/RADIOACTIVITY
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
SOILS/RADIONUCLIDE MIGRATION
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
SOILS/SENSIBLE HEAT STORAGE
Long duration earth storage of solar energy, 3:44561 (CONF-761220-)
Storage of solar energy in the ground, 3:44566
SOLAR ABSORBERS/BLACK COATINGS
Solar collector having selective film of improved stability to liquid water condensate, 3:44520
SOLAR ABSORBERS/DESIGN
Solar energy absorber (Patent), 3:44538
Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling, 3:44475 (CONF-761220-)
SOLAR ABSORBERS/MATERIALS TESTING
Investigations of the corrosion behaviour of aluminium rollbond absorbers, 3:44553
SOLAR ABSORBERS/OPTIMIZATION
Optimization of heat exchangers for solar concentrators, 3:44495 (CONF-761220-)
SOLAR ABSORBERS/PERFORMANCE TESTING
Comparative performance of several flat plate designs, 3:44477 (CONF-761220-)
SOLAR ABSORBERS/SPECTRALLY SELECTIVE SURFACES
Solar absorption surface panel (Patent), 3:44526
SOLAR ACTIVITY
See also SOLAR FLARES
SOLAR WIND
SOLAR X-RAY BURSTS
SOLAR ACTIVITY/TABLES
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
SOLAR AIR CONDITIONERS/ABSORPTION REFRIGERATION CYCLE
Alternate working fluids for solar air conditioning applications, 3:44439 (CONF-761220-)
SOLAR AIR CONDITIONERS/COMPUTER CODES
Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC), 3:44429 (CONF-761220-)
SOLAR AIR CONDITIONERS/DESIGN
Solar air conditioning system (Patent), 3:44446
SOLAR AIR CONDITIONERS/EVALUATION
Solar-powered dehumidification, 3:44424 (CONF-761220-)
SOLAR AIR CONDITIONERS/OPTIMIZATION
Computer simulation and system optimization of a solar powered absorption cooling process, 3:44430 (CONF-761220-)
SOLAR AIR CONDITIONERS/PERFORMANCE
Performance of Rankine Cooling System with intermediate temperature solar collectors, 3:44496 (CONF-761220-)
SOLAR AIR CONDITIONERS/PERFORMANCE TESTING
Performance tests of an improved three ton air conditioner for the Honeywell Mobile Solar Research Facility, 3:44421 (CONF-761220-)
SOLAR AIR CONDITIONERS/SIMULATION
Computer simulation and system optimization of a solar powered absorption cooling process, 3:44430 (CONF-761220-)
Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC), 3:44428 (CONF-761220-)
Simulation of a solar-assisted and open cycle cooling system using air as the transport medium, 3:44431 (CONF-761220-)
SOLAR AIR CONDITIONERS/SOLAR COLLECTORS
Performance of Rankine Cooling System with intermediate temperature solar collectors, 3:44496 (CONF-761220-)
SOLAR AIR CONDITIONERS/THERMODYNAMICS
Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC), 3:44428 (CONF-761220-)
SOLAR AIR CONDITIONERS/WORKING FLUIDS
Alternate working fluids for solar air conditioning applications, 3:44439 (CONF-761220-)
SOLAR AIR CONDITIONING/SIMULATION
Comparison of simulated solar cooling systems in Saudia Arabia, 3:44432 (CONF-761220-)
SOLAR ATMOSPHERE/MAGNETIC FIELDS
Magnetic fields of active regions and their zero points, 3:45459
SOLAR CELL ARRAYS/CONTROL SYSTEMS
Design and stability of master control systems for energy independent homes, 3:44435 (CONF-761220-)
SOLAR CELL ARRAYS/DESIGN
Solar cell shingle (Patent), 3:44381
Solar cell electric and heating system (Patent), 3:44370
Solar converter (Patent), 3:44385
Solar panel (Patent), 3:44380

SOLAR CELL ARRAYS/ECONOMIC ANALYSIS
Phase 2, automated array assembly, Task IV, Low Cost Silicon Solar Array Project. Quarterly report No. 1, November 1, 1977-January 28, 1978, 3:44358 (DOE/JPL/954898-1)
SOLAR CELL ARRAYS/ENCAPSULATION
Encapsulated solar cell assembly (Patent), 3:44371
SOLAR CELL ARRAYS/FABRICATION
Device for converting of radiation into electric power (Patent), 3:44384
SOLAR CELL ARRAYS/PERFORMANCE
ATS-6 solar cell experiment/improvement. Final report, 1 January-31 December 1976, 3:44393 (N-77-33607)
SOLAR CELL ARRAYS/PRODUCTION
Phase 2, automated array assembly, Task IV, Low Cost Silicon Solar Array Project. Quarterly report No. 1, November 1, 1977-January 28, 1978, 3:44358 (DOE/JPL/954898-1)
SOLAR CELLS
See also CADMIUM SULFIDE SOLAR CELLS
GALLIUM ARSENIDE SOLAR CELLS
SILICON SOLAR CELLS
SOLAR CELLS/ANTIREFLECTION COATINGS
Encapsulated solar cell assembly (Patent), 3:44371
SOLAR CELLS/COST
Usable electricity from the Sun, 3:44361 (N-77-81939)
SOLAR CELLS/EFFICIENCY
Emitter current suppression in a high-low-junction emitter solar cell using an oxide-charge-induced electron accumulation layer, 3:44365
Organometallic-sourced VPE AlGaAs/GaAs concentrator solar cells having conversion efficiencies of 19%, 3:44366
p-n junction formation in boron-deposited silicon by laser-induced diffusion, 3:44362
Possible explanation for the photovoltaic effect in indium tin oxide on InP solar cells, 3:44364
SOLAR CELLS/ENCAPSULATION
Encapsulated solar cell assembly (Patent), 3:44371
SOLAR CELLS/FABRICATION
Thin film photovoltaic diodes and method for making same (Patent), 3:44379
SOLAR CELLS/PERFORMANCE
ATS-6 solar cell experiment/improvement. Final report, 1 January-31 December 1976, 3:44393 (N-77-33607)
High-efficiency p^+-n-n^+ back-surface-field silicon solar cells, 3:44363
SnO_2/Si solar cells: heterostructure or Schottky-barrier or MIS-type device, 3:44368
SOLAR CELLS/TECHNOLOGY ASSESSMENT
Usable electricity from the Sun, 3:44361 (N-77-81939)
SOLAR COLLECTORS
See also CONCENTRATING COLLECTORS
EVACUATED TUBE COLLECTORS
FLAT PLATE COLLECTORS
SOLAR COLLECTORS/BUILDING MATERIALS
Solar heat collecting porous building blocks (Patent), 3:44532
SOLAR COLLECTORS/CONFIGURATION
Design criterion on flat solar collectors based on thermal efficiency measurements, 3:44482 (CONF-761220-)
SOLAR COLLECTORS/CONTROL SYSTEMS
Solar heat collector system, parts therefor and methods (Patent), 3:44528
SOLAR COLLECTORS/CORROSION
Compatibility of materials in solar collectors, 3:44486 (CONF-761220-)
SOLAR COLLECTORS/CORROSION RESISTANCE
Investigations of the corrosion behaviour of aluminium rollbond absorbers, 3:44553
SOLAR COLLECTORS/COST
Performance of low cost solar panels, 3:44480 (CONF-761220-)
SOLAR COLLECTORS/DESIGN
Apparatus for the utilization of solar heat (Patent), 3:44518
Highly efficient solar collector including means for preventing cover plate fluid condensation (Patent), 3:44550
Portable solar energy collector (Patent), 3:44501
Radiant energy collector panel and system (Patent), 3:44504
Solar cell electric and heating system (Patent), 3:44370
Solar collectos (Patent), 3:44530
Solar energy collector panel (Patent), 3:44535
Solar energy heat collector (Patent), 3:44514
Solar heating system (Patent), 3:44443
Solar heater (Patent), 3:44547
Solar heat collecting porous building blocks (Patent), 3:44532
Solar heat collector system, parts therefor and methods (Patent), 3:44528
Solar heater (Patent), 3:44517
Solar heater and condenser (Patent), 3:44509
Solar panel (Patent), 3:44503
Solar steam boiler (Patent), 3:44519
Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling, 3:44475 (CONF-761220-)
SOLAR COLLECTORS/EVALUATION
Performance of Rankine Cooling System with intermediate temperature solar collectors, 3:44496 (CONF-761220-)
SOLAR COLLECTORS/FABRICATION
Self-jigging method of fabricating solar collector heat trap from flexible plastic roll material (Patent), 3:44533
SOLAR COLLECTORS/GLAZING MATERIALS
Glazing for transmitting solar radiation (Patent), 3:44537
SOLAR COLLECTORS/HEAT PIPES
Solar heat pipe (Patent), 3:44534
SOLAR COLLECTORS/HEAT TRANSFER
Radiant energy collector panel and system (Patent), 3:44504
SOLAR COLLECTORS/HEAT TRANSFER FLUIDS
Organic heat transfer fluid for solar circuits, 3:44555
SOLAR COLLECTORS/MATERIALS TESTING
Compatibility of materials in solar collectors, 3:44486 (CONF-761220-)
SOLAR COLLECTORS/OPTIMIZATION
Simplified model for the solar collector: load interaction, 3:44433 (CONF-761220-)
SOLAR COLLECTORS/PERFORMANCE
Performance of low cost solar panels, 3:44480 (CONF-761220-)
SOLAR COLLECTORS/PERFORMANCE TESTING
Comparative performance of several flat plate designs, 3:44477 (CONF-761220-)
Experimental and theoretical performance study of solar collectors, 3:44479 (CONF-761220-)
SOLAR COLLECTORS/SENSIBLE HEAT STORAGE
System for storage and use of solar energy (Patent), 3:44505
SOLAR COLLECTORS/SIMULATION
Simplified model for the solar collector: load interaction, 3:44433 (CONF-761220-)
SOLAR COLLECTORS/SOLAR TRACKING
Solar energy device (Patent), 3:44542
SOLAR COLLECTORS/TEST FACILITIES
Experimental and theoretical performance study of solar collectors, 3:44479 (CONF-761220-)
SOLAR COLLECTORS/THERMAL EFFICIENCY
Design criterion on flat solar collectors based on thermal efficiency measurements, 3:44482 (CONF-761220-)
SOLAR CONCENTRATORS
See also COMPOUND PARABOLIC CONCENTRATORS
FRESNEL LENS
SOLAR REFLECTORS
SOLAR CONCENTRATORS/DESIGN
Ideal flux concentrators with reflector gaps, 3:44499
SOLAR CONCENTRATORS/OPTIMIZATION
Optimization of heat exchangers for solar concentrators, 3:44495 (CONF-761220-)
SOLAR CONCENTRATORS/SOLAR ABSORBERS
Optimization of heat exchangers for solar concentrators, 3:44495 (CONF-761220-)
SOLAR COOKERS/DESIGN
Portable solar cooker and the solar panel used therein (Patent), 3:44469
SOLAR COOLING SYSTEMS
See also SOLAR AIR CONDITIONING
See SOLAR AIR CONDITIONERS
SOLAR COOLING SYSTEMS/ABSORPTION REFRIGERATION CYCLE
Heat pump assisted solar powered absorption system (Patent), 3:44445
SOLAR COOLING SYSTEMS/COMMERCIALIZATION
Commercialization of solar heating and cooling of buildings, 3:44347 (CONF-761220-)
SOLAR COOLING SYSTEMS/CONTROL SYSTEMS
Design and stability of master control systems for energy independent homes, 3:44435 (CONF-761220-)
Solar collector and heating and cooling system (Patent), 3:44442
SOLAR COOLING SYSTEMS/DATA ACQUISITION SYSTEMS
Digital processor-based control for a solar monitoring and test station, 3:44434 (CONF-761220-)
User's guide to the monthly performance report of the National Solar Data Program, 3:44441 (SOLAR/0004-78/18)
SOLAR COOLING SYSTEMS/DEMONSTRATION PROGRAMS
User's guide to the monthly performance report of the National Solar Data Program, 3:44441 (SOLAR/0004-78/18)
SOLAR COOLING SYSTEMS/DESICCANTS
Desiccant systems potential for cooling in humid climates, 3:44426 (CONF-761220-)
SOLAR COOLING SYSTEMS/DESIGN
Heat pump assisted solar powered absorption system (Patent), 3:44445

Modular solar house, 3:44404 (CONF-761220-)
Solar collector and heating and cooling system (Patent), 3:44442
Solar energy research facility at the University of Texas at Arlington, 3:44410 (CONF-761220-)
SOLAR COOLING SYSTEMS/DIAGRAMS
Solar cooling of a 25,000 square foot office building, 3:44422 (CONF-761220-)
SOLAR COOLING SYSTEMS/INSTALLATION
Labor costs associated with solar equipment installation for commercial buildings, 3:44438 (CONF-761220-)
SOLAR COOLING SYSTEMS/MARKET
System for projecting the utilization of renewable resources. SPURR methodology, 3:44348 (ERHQ/2322-77/4)
SOLAR COOLING SYSTEMS/MEETINGS
Solar cooling and heating: a national forum. Proceedings of condensed papers, 3:44402 (CONF-761220-)
SOLAR COOLING SYSTEMS/NETWORK ANALYSIS
Solar energy coupled networks, 3:44436 (CONF-761220-)
SOLAR COOLING SYSTEMS/PERFORMANCE
Performance of the UNL-LES solar-heat pump demonstration home, 3:44413 (CONF-761220-)
SOLAR COOLING SYSTEMS/RETROFITTING
Solar cooling, Florida welcome station, 3:44423 (CONF-761220-)
SOLAR CORONA/MAGNETIC FIELDS
Sources of magnetic fields in recurrent interplanetary streams, 3:45478 (N-77-34091)
SOLAR DRYERS
Possibilities of using solar energy in dryers for agricultural products, 3:44458
SOLAR DRYERS/DESIGN
Solar curing and drying structure and method of utilizing solar energy associated with available solar radiation in curing and drying various materials (Patent), 3:44474
SOLAR DRYERS/OPERATION
Utilization of solar energy for cooling and drying systems, 3:44467 (CONF-761220-)
SOLAR ENERGY
Today's and tomorrow's energy sources for homes, 3:44342
SOLAR ENERGY/COMMERCIALIZATION
Ecologically suitable use of solar energy: building block for an appropriate technology for developing and industrialized countries, 3:44355
Problems arising from the introduction of solar systems in the FRG. Problem identification and remedies, 3:44351
SOLAR ENERGY/EDUCATION
Short course on solar technology for heating and plumbing tradesmen, 3:44345
SOLAR ENERGY/ENERGY CONVERSION
Energy conversion system (Patent), 3:44609
SOLAR ENERGY/ENERGY STORAGE
Economics of internal and external energy storage in solar energy applications, 3:44559 (CONF-761220-)
SOLAR ENERGY/ENGINEERING
Energy engineer - a profession of the near future, 3:44933
SOLAR ENERGY/ENVIRONMENTAL IMPACTS
Ecologically suitable use of solar energy: building block for an appropriate technology for developing and industrialized countries, 3:44355
SOLAR ENERGY/HEAT STORAGE
Solar energy - competitive because of cascade batteries, 3:44567
Storage of solar energy in the ground, 3:44566
Storage of solar energy. Necessity and some principles, 3:44565
SOLAR ENERGY/LEGAL ASPECTS
Solar energy systems from the point of view of the building inspector, 3:44352
SOLAR ENERGY/MARKET
Overview and market penetration methodology of a computer simulation model for projecting solar energy utilization, 3:44349
SOLAR ENERGY/PUBLIC RELATIONS
Solar publicity - wishes and realities, 3:44859
SOLAR ENERGY/REVIEWS
History of solar utilization, 3:44341 (CONF-761220-)
SOLAR ENERGY/SOCIO-ECONOMIC FACTORS
Problems arising from the introduction of solar systems in the FRG. Problem identification and remedies, 3:44351
Solar aesthetics and incentives, 3:44401 (CONF-761220-)
System for applied digestion of information about solar technology, 3:44353
SOLAR ENERGY/TECHNOLOGY TRANSFER
Use of solar energy equipment in developing countries as an example for a 'soft technology' and the possibilities for its promotion, 3:44343
SOLAR ENERGY/TECHNOLOGY UTILIZATION
Promotion of solar technology in Baden-Wuerttemberg, 3:44885
SOLAR ENERGY CONVERSION
Direct conversion of solar energy to mechanical energy (Patent), 3:44471
SOLAR ENERGY CONVERSION/PHOTOCHEMISTRY
Photochemical aspects of solar energy conversion, 3:44391
SOLAR ENERGY CONVERSION/PHOTOSYNTHESIS
Utilization of solar energy through photosynthesis and artificial water photolysis, 3:44389
SOLAR ENERGY CONVERSION/SILICON SOLAR CELLS
Optical performance of absorber-reflector combinations for photothermal solar energy conversion, 3:44374
SOLAR FLARES/ASYMMETRY
Direction pattern of the microwave radio flares of the Sun, 3:45464
SOLAR FLARES/MAGNETIC FIELD CONFIGURATIONS
Phenomenological model of solar flares, 3:45454
SOLAR FLARES/TABLES
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
SOLAR FLUX/CALCULATION METHODS
Solar radiation data base development based on bright sunshine data, 3:44346 (CONF-761220-)
SOLAR FLUX/DATA ACQUISITION
Solar radiation data base development based on bright sunshine data, 3:44346 (CONF-761220-)
SOLAR HEAT ENGINES/DESIGN
Direct conversion of solar energy to mechanical energy (Patent), 3:44471
Solar energy collector (Patent), 3:44508
SOLAR HEATING SYSTEMS
See also PASSIVE SOLAR HEATING SYSTEMS
Solar energy saves annually 5000 l heating fuel oil. Water heating and additional heating in Simbach/Inn, 3:44463
Solar heating and cooling of buildings in Greece with special reference to schools, 3:44407 (CONF-761220-)
Technical economical study of the solar house situated in Cuarte De Huerva (Zaragoza), 3:44409 (CONF-761220-)
Use of solar energy for space heating in individual dwellings in Kansas, 3:44417 (CONF-761220-)
SOLAR HEATING SYSTEMS/ABSORPTION REFRIGERATION CYCLE
Heat pump assisted solar powered absorption system (Patent), 3:44445
SOLAR HEATING SYSTEMS/COMMERCIALIZATION
Commercialization of solar heating and cooling of buildings, 3:44347 (CONF-761220-)
SOLAR HEATING SYSTEMS/COMPUTER CODES
Dynamic simulation of a solar powered Rankine Cycle/Vapor Compression Cycle (RC/VCC), 3:44429 (CONF-761220-)
SOLAR HEATING SYSTEMS/CONSTRUCTION
Solar heating system for recreation building at Scattergood School, 3:44440 (DOE/NASA/CR-150553)
SOLAR HEATING SYSTEMS/CONTROL SYSTEMS
Design and stability of master control systems for energy independent homes, 3:44435 (CONF-761220-)
Microprocessor instrumentation and control of the University of Louisville's Dual Solar Energy Research Center, 3:44437 (CONF-761220-)
Solar collector and heating and cooling system (Patent), 3:44442
SOLAR HEATING SYSTEMS/DATA ACQUISITION SYSTEMS
Digital processor-based control for a solar monitoring and test station, 3:44434 (CONF-761220-)
User's guide to the monthly performance report of the National Solar Data Program, 3:44441 (SOLAR/0004-78/18)
SOLAR HEATING SYSTEMS/DEMONSTRATION PROGRAMS
Residential solar demonstration program of the U.S. Department of Housing and Urban Development, 3:44455
User's guide to the monthly performance report of the National Solar Data Program, 3:44441 (SOLAR/0004-78/18)
SOLAR HEATING SYSTEMS/DESIGN
Europe's biggest solar house stands in Swabia. Hot water supply and space heating in 'Heggbach', a home for the disabled, 3:44450
Heat pump assisted solar powered absorption system (Patent), 3:44445
Modular solar house, 3:44404 (CONF-761220-)
Process of and apparatus for solar heating and the like (Patent), 3:44444
Solar collector and heating and cooling system (Patent), 3:44442
Solar energy research facility at the University of Texas at Arlington, 3:44410 (CONF-761220-)
Solar heating system and operation thereof (Patent), 3:44448
Solar heating system (Patent), 3:44447
Solar heating system (Patent), 3:44443
Solar plant and large-scale store for office buildings. Operational experience confirms: 42 m^2 collector area and a 15 m^3 store save 6,800 l heating fuel oil annually, 3:44449

SOLAR HEATING SYSTEMS/DIAGRAMS
Solar cooling of a 25,000 square foot office building, 3:44422 (CONF-761220-)
SOLAR HEATING SYSTEMS/ECONOMICS
Solar energy utilization in multivalent heating systems, 3:44451
SOLAR HEATING SYSTEMS/FEASIBILITY STUDIES
University of Louisville Dual Solar Energy Research Center, 3:44412 (CONF-761220-)
Wind-solar coupled domestic heating system, 3:44419 (CONF-761220-)
SOLAR HEATING SYSTEMS/HEAT TRANSFER FLUIDS
Organic heat transfer fluid for solar circuits, 3:44555
SOLAR HEATING SYSTEMS/INSTALLATION
Labor costs associated with solar equipment installation for commercial buildings, 3:44438 (CONF-761220-)
SOLAR HEATING SYSTEMS/LATENT HEAT STORAGE
Application of latent-heat storage element in solar-heated buildings, 3:44557
SOLAR HEATING SYSTEMS/LEGAL ASPECTS
Solar energy systems from the point of view of the building inspector, 3:44352
SOLAR HEATING SYSTEMS/MARKET
Residential solar demonstration program of the U.S. Department of Housing and Urban Development, 3:44455
System for projecting the utilization of renewable resources. SPURR methodology, 3:44348 (ERHQ/2322-77/4)
SOLAR HEATING SYSTEMS/MEETINGS
Solar cooling and heating: a national forum. Proceedings of condensed papers, 3:44402 (CONF-761220-)
SOLAR HEATING SYSTEMS/PERFORMANCE
Operating results: a competitively priced home heated by concentrating solar collectors, 3:44420 (CONF-761220-)
Performance of the UNL-LES solar-heat pump demonstration home, 3:44413 (CONF-761220-)
Solar heating system for recreation building at Scattergood School, 3:44440 (DOE/NASA/CR-150553)
SOLAR HEATING SYSTEMS/RESEARCH PROGRAMS
Brighton Polytechnic Integrated Solar Dwelling (ISD), 3:44411 (CONF-761220-)
SOLAR HEATING SYSTEMS/RETROFITTING
Solar cooling, Florida welcome station, 3:44423 (CONF-761220-)
SOLAR HEATING SYSTEMS/SIMULATION
Simulation of the solar assisted heating and snow-melting system of a commercial bank building in Buffalo, New York, 3:44465 (CONF-761220-)
SOLAR HEATING SYSTEMS/WORKING FLUIDS
Ideal greenhouse, 3:44408 (CONF-761220-)
SOLAR INDUSTRY/BUILDING MATERIALS
Solarized office: architectural implications in office planning and design, utilizing direct solar gain by means of 'solar modulators', 'transparent insulation', and 'solar storage tiles', 3:44403 (CONF-761220-)
SOLAR INDUSTRY/CRAFTSMEN
Profession of the 'solar crafter', 3:44344
SOLAR INDUSTRY/MANAGEMENT
Managing innovation in newly established solar energy enterprises, 3:44350
SOLAR INDUSTRY/SMALL BUSINESSES
Managing innovation in newly established solar energy enterprises, 3:44350
SOLAR NEUTRINOS/NEUTRINO DETECTION
Proposed solar-neutrino experiment using ^{71}Ga, 3:45453
SOLAR PONDS/MATHEMATICAL MODELS
Demonstration salt gradient solar pond. First biannual progress report to the U.S. DOE, 3:44498 (TID-28168)
SOLAR PONDS/TEMPERATURE DISTRIBUTION
Demonstration salt gradient solar pond. First biannual progress report to the U.S. DOE, 3:44498 (TID-28168)
SOLAR PONDS/THERMAL EFFICIENCY
Laboratory solar pond, 3:44564 (CONF-761220-)
SOLAR POWER PLANTS
See also ORBITAL SOLAR POWER PLANTS
SOLAR THERMAL POWER PLANTS
SOLAR POWER PLANTS/MARKET
System for projecting the utilization of renewable resources. SPURR methodology, 3:44348 (ERHQ/2322-77/4)
SOLAR PROCESS HEAT
Process water heating by solar augmentation for the textile industry, 3:44457 (CONF-761220-)
SOLAR PROCESS HEAT/COST
System approach to determine an optimal system for supplying industrial process hot water using solar energy, 3:44456 (CONF-761220-)
SOLAR PROCESS HEAT/MARKET
System for projecting the utilization of renewable resources. SPURR methodology, 3:44348 (ERHQ/2322-77/4)
SOLAR PROCESS HEAT/OPTIMIZATION
System approach to determine an optimal system for supplying industrial process hot water using solar energy, 3:44456 (CONF-761220-)
SOLAR RADIOWAVE RADIATION/TABLES
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
SOLAR REFLECTORS
See also PARABOLIC REFLECTORS
SOLAR REFLECTORS/DESIGN
Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling, 3:44475 (CONF-761220-)
SOLAR REFRIGERATION/COST
Utilization of solar energy for cooling and drying systems, 3:44467 (CONF-761220-)
SOLAR REFRIGERATORS/PARABOLIC COLLECTORS
Solar heated absorption refrigeration system, 3:44497 (CONF-761220-)
SOLAR REFRIGERATORS/PERFORMANCE
Performance of solar driven absorption refrigerator systems, 3:44466 (CONF-761220-)
SOLAR SPACE HEATING
Big firms, too, back solar energy. Successful meeting of the Arbeitsgemeinschaft Solarenergie, 3:44452
Heat production and distribution in buildings with solar energy and heat pumps, 3:44931
Solar energy for the hotel/motel industry, 3:44414 (CONF-761220-)
SOLAR STILLS/DESIGN
Desalination apparatus (Patent), 3:44470
Solar powered gas generation (Patent; combined solar thermal power plant for electrolysis of seawater and solar still), 3:44399
Solar powered distilling device (Patent), 3:44473
SOLAR THERMAL POWER PLANTS/COMPARATIVE EVALUATIONS
Method for comparing solar energy power systems for developing countries, 3:44397
SOLAR THERMAL POWER PLANTS/DESIGN
Power plant (Patent), 3:44395
SOLAR THERMAL POWER PLANTS/GAS TURBINES
Gas turbine cycles for effective use of solar energy, 3:44396
SOLAR THERMAL POWER PLANTS/HEAT TRANSFER FLUIDS
Organic heat transfer fluid for solar circuits, 3:44555
SOLAR THERMAL POWER PLANTS/HYBRID SYSTEMS
Solar powered gas generation (Patent; combined solar thermal power plant for electrolysis of seawater and solar still), 3:44399
SOLAR THERMAL POWER PLANTS/SENSIBLE HEAT STORAGE
Geothermal storage of solar energy for electric power systems, 3:44558 (CONF-761220-)
SOLAR THERMAL POWER PLANTS/WORKING FLUIDS
Organic heat transfer fluid for solar circuits, 3:44555
SOLAR TRACKING/EQUIPMENT
Solar energy device (Patent), 3:44542
Solar energy operated motor apparatus (Patent; based on fluid transfer in closed system caused by temperature differential), 3:44511
SOLAR WATER HEATERS
Solar energy saves annually 5000 l heating fuel oil. Water heating and additional heating in Simbach/Inn, 3:44463
System approach to determine an optimal system for supplying industrial process hot water using solar energy, 3:44456 (CONF-761220-)
SOLAR WATER HEATERS/CONTROL SYSTEMS
Control and optimization of solar water heating systems in univeristy buildings, 3:44462 (CONF-761220-)
Design and stability of master control systems for energy independent homes, 3:44435 (CONF-761220-)
SOLAR WATER HEATERS/DESIGN
Europe's biggest solar house stands in Swabia. Hot water supply and space heating in 'Heggbach', a home for the disabled, 3:44450
Solar energy system for domestic hot water heating (Museum of Science and Industry, Chicago), 3:44461 (CONF-761220-)
Solar heater (Patent), 3:44547
Solar panel (Patent), 3:44503
Solar plant and large-scale store for office buildings. Operational experience confirms: 42 m^2 collector area and a 15 m^3 store save 6,800 l heating fuel oil annually, 3:44449
SOLAR WATER HEATERS/OPTIMIZATION
Control and optimization of solar water heating systems in univeristy buildings, 3:44462 (CONF-761220-)

SOLAR WATER HEATERS/THERMAL ENERGY STORAGE EQUIPMENT
New type dual storage unit for solar water heating, 3:44464
SOLAR WATER HEATING
Big firms, too, back solar energy. Successful meeting of the Arbeitsgemeinschaft Solarenergie, 3:44452
Solar energy for the hotel/motel industry, 3:44414 (CONF-761220-)
SOLAR WATER PUMPS/FEASIBILITY STUDIES
Solar powered irrigation: present status and future outlook, 3:44468 (SAND-78-0016C)
SOLAR WIND/INTERACTIONS
Interplanetary medium data book, 3:45473 (N-77-34065)
SOLAR WIND/INTERFACES
Solar wind stream interfaces, 3:45457
SOLAR WIND/ORIGIN
Sources of magnetic fields in recurrent interplanetary streams, 3:45478 (N-77-34091)
SOLAR WIND/SHOCK WAVES
Parameters of the solar wind responsible for plasma injection into the region of the magnetospheric ring current, 3:45463
Shock-associated energetic proton events at large heliocentric distances, 3:45455
SOLAR WIND/TABLES
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
SOLAR WIND/VARIATIONS
Long-term variations of selected solar wind properties: Imp 6, 7, and 8 results, 3:45456
SOLAR X-RAY BURSTS/TABLES
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
SOLAR-ASSISTED HEAT PUMPS
Performance of the UNL-LES solar-heat pump demonstration home, 3:44413 (CONF-761220-)
Solar energy system of the Institute of Molecular Biology, Salzburg of the Austrian Academy of Science, 3:44418 (CONF-761220-)
Upton Community Multi-Purpose Center, Baltimore, Maryland, 3:44415 (CONF-761220-)
SOLAR-ASSISTED HEAT PUMPS/ABSORPTION HEAT
Application of the chemical heat pump for heat storage: the system 'PAWA', 3:44846
SOLAR-ASSISTED HEAT PUMPS/REVIEWS
Solar-assisted heat pump for northern latitudes, 3:44416 (CONF-761220-)
SOL-GEL PROCESS
Progress on sol-gel sphere-pac development, 3:44259 (CONF-780535-1)
SOLID SCINTILLATION DETECTORS/PARTICLE DISCRIMINATION
Pulse-shape discrimination of high-energy neutrons and gamma rays in NaI(Tl), 3:45256
SOLID STATE LASERS/AMPLIFIERS
Optical emitter or amplifier for energy-rich radiation (Laser) (Patent), 3:45211
SOLID STATE LASERS/MODE LOCKING
Axial mode locking in a solid-state laser with a time-varying cavity, 3:45206
SOLID STATE LASERS/RODS
Distributed aperture effect in laser rods with negative lenses, 3:45179
SOLID STATE LASERS/WAVELENGTHS
Organic-dye attachment for converting the wavelength of the radiation of pulsed solid-state and gas lasers, 3:45193
SOLID WASTES
See also AGRICULTURAL WASTES
MILL TAILINGS
MINERAL WASTES
SOLID WASTES/ANAEROBIC DIGESTION
High quality methane gas through modified anaerobic digestion (Patent; at 2 to 5 atm and incorporation of pressurized recirculation), 3:44337
SOLID WASTES/CONVERSION
Synthetic fuels: methane (citations from the Engineering Index data base). Report for 1970-1977, 3:44328 (NTIS/PS-78/0054)
SOLID WASTES/RECYCLING
Economic adjustment strategy study for San Joaquin County, California, 3:44963 (PB-274556)
SOLIDIFICATION/HEAT FLOW
Theoretical analysis of heat flow in horizontal ribbon growth from a melt, 3:45864
SOLIDS/DIFFUSION
Diffusion coefficient determination using a size-variation technique, 3:45833
SOLITONS/FEYNMAN PATH INTEGRAL
Path-integral quantization of solitons using the zero-mode Feynman rule, 3:45663
SOLITONS/THREE-DIMENSIONAL CALCULATIONS
Three-dimensional effects in the non-linear propagation of lower-hybrid waves, 3:46048
SOLITONS/WAVE PROPAGATION
Three-dimensional effects in the non-linear propagation of lower-hybrid waves, 3:46048
SOLUTIONS
(For mathematical solutions see ANALYTICAL SOLUTION or NUMERICAL SOLUTION.)
SOLUTIONS/FLUORESCENCE
Measurement of fluorescence polarization at high pressure, 3:45123
SOLUTIONS/VERY HIGH PRESSURE
Measurement of fluorescence polarization at high pressure, 3:45123
SOLVENT-REFINED COAL/HYDROGENATION
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
SOLVENT-REFINED COAL/REFINING
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1977, 3:44065 (FE-2315-19)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, October-December 1977, 3:44208 (FE-2315-22)
SOLVENT-REFINED COAL/TECHNOLOGY ASSESSMENT
Advanced processes for generation of electric power: solvent refining of coal and combined cycle plants, 3:44072 (CONF-7710101-11)
SOLVENT-REFINING COAL PLANTS
See COAL PREPARATION PLANTS
SOOT/WASTE PRODUCT UTILIZATION
Method to produce synthesis gas (Patent), 3:44332
SOUND
See SOUND WAVES
SOUND WAVES/WAVE PROPAGATION
Nonlinear sound generation by high energy particles (Debye-like modes, temperature dependence, proton deposition mechanism), 3:45861 (COO-3130TA-341)
SOUTH CAROLINA/METEOROLOGY
Continental margin atmospheric climatology and sea level (Historical setting 1974-1975), 3:45436 (SRO-902-8)
SOUTH DAKOTA/URANIUM DEPOSITS
Origin of uranium in the middle Precambrian Estes Conglomerate, Eastern Black Hills, South Dakota: inferences from lead isotopes, 3:44243 (USGS-CIRC-753)
SOVIET UNION
See USSR
SPACE HEATING/ENERGY CONSERVATION
Annual heating energy demand of heavy domestic buildings. Report No. 16, 3:44940 (NP-23142)
Mixed control for radiators, 3:44928
SPACE HEATING/ENERGY CONSUMPTION
Annual heating energy demand of heavy domestic buildings. Report No. 16, 3:44940 (NP-23142)
SPACE VEHICLES/LIQUID FUELS
Small-amplitude periodic sloshing modes of a liquid in a vertical right circular cylinder with a concave spheroidal bottom, 3:45549 (LBL-7204)
SPACECRAFT POWER SUPPLIES/THERMOELECTRIC GENERATORS
Safety methodology for space nuclear systems. Final report, 3:44324 (AD-A-048780)
SPARK IGNITION ENGINES/CATALYTIC CONVERTERS
Catalysts for the control of automotive pollutants (Fourteen papers), 3:44981
Catalytic reduction of oxides of nitrogen emissions into auto exhaust gas, 3:44982
Chemistry of degradation in automotive emission control catalysts, 3:44992
Comparison of platinum and base metal oxidation catalysts, 3:44991
Deposition and distribution of lead, phosphorus, calcium, zinc, and sulfur poisons on automobile exhaust NO/sub x/ catalysts, 3:44986
Optimum distribution of catalytic material on support layers in automotive catalysis, 3:44993
Oxidation of CO and C_2H_4 by base metal catalysts prepared on honeycomb supports, 3:44996
Oxidative automotive emission control catalysts: selected factors affecting catalyst activity, 3:44994

Platinum catalysts for exhaust emission control: the mechanism of catalyst poisoning by lead and phosphorus compounds, 3:44985
Relative resistance of noble metal catalysts to thermal deactivation, 3:44989
Spinel solid solution catalysts for automotive applications, 3:44995
Thermally stable carriers, 3:44987
Thermodynamic interaction between transition metals and simulated auto exhaust, 3:44984
Variation of selectivity with support chemistry in NO/sub x/ removal catalysts, 3:44990

SPARK IGNITION ENGINES/DESIGN
Variable-displacement spark-ignition engine. Final report, 3:44973 (SAND-77-8299)

SPARK IGNITION ENGINES/EXHAUST GASES
Variable-displacement spark-ignition engine. Final report, 3:44973 (SAND-77-8299)

SPARK IGNITION ENGINES/FUEL ECONOMY
Variable-displacement spark-ignition engine. Final report, 3:44973 (SAND-77-8299)

SPARKS (ELECTRIC)
See ELECTRIC SPARKS

SPECTRALLY SELECTIVE SURFACES
Solar absorption surface panel (Patent), 3:44526

SPECTRALLY SELECTIVE SURFACES/ABSORPTIVITY
New black chrome selective absorbing surface, 3:44483 (CONF-761220-)

SPECTRALLY SELECTIVE SURFACES/CHEMICAL PREPARATION
Solar collector having selective film of improved stability to liquid water condensate, 3:44520

SPECTRALLY SELECTIVE SURFACES/REFLECTIVITY
New black chrome selective absorbing surface, 3:44483 (CONF-761220-)

SPECTRALLY SELECTIVE SURFACES/STABILIZATION
Solar collector having selective film of improved stability to liquid water condensate, 3:44520

SPENT FUEL CASKS/COOLING SYSTEMS
Parametric evaluation of heat transfer and coolant options for breeder reactor spent fuel shipping casks designs, 3:45153 (SAND-77-1415C)

SPENT FUEL CASKS/DESIGN
Parametric evaluation of heat transfer and coolant options for breeder reactor spent fuel shipping casks designs, 3:45153 (SAND-77-1415C)

SPENT FUEL CASKS/DYNAMIC LOADS
Cargo response to railcar impact and tiedown load analysis, 3:45152 (LA-UR-78-1210)

SPENT FUEL CASKS/SHIELDING
Examination on neutron shielding for a spent fuel shipping cask, 3:45154

SPENT FUEL ELEMENTS/ACTIVITY LEVELS
Calculations of neutron radiation levels from HTGR spent fuel, 3:44660

SPENT FUEL ELEMENTS/TRANSPORT
Examination on neutron shielding for a spent fuel shipping cask, 3:45154
Parametric evaluation of heat transfer and coolant options for breeder reactor spent fuel shipping casks designs, 3:45153 (SAND-77-1415C)

SPENT FUELS
Nuclear reactor spent fuel valuation: procedure, applications, and analysis, 3:44725 (R-2239-DOE)
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 1: starting materials: uranium ore, separated uranium and uranium mill tailings, and Part 2: irradiated fuel, 3:44661 (AECL-4436/1)
Tables of the isotopic composition of transuranium elements produced in Canadian D_2O moderated reactors, 3:44675 (AECL-5904)

SPENT FUELS/AFTER-HEAT
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 3: reprocessed fuel: plutonium product, and high level waste, 3:44264 (AECL-4436/2)

SPENT FUELS/REPROCESSING
Process for the conditioning of irradiated nuclear fuel (Patent), 3:44266 (BNWL-tr-319)

SPENT FUELS/TOXICITY
Radioactive decay properties of CANDU fuel. Volume 1: the natural uranium fuel cycle. Part 3: reprocessed fuel: plutonium product, and high level waste, 3:44264 (AECL-4436/2)

SPENT FUELS/TRANSPORT
Analysis of alternative transportation methods for radioactive materials shipments including the use of special trains for spent fuel and wastes (Radiological impact), 3:44272 (CONF-780506-9)
Current status and future considerations for a transportation system for spent fuel and radioactive waste, 3:44275 (Y/OWI/SUB-77/42513)

SPRAY COOLING/AERODYNAMICS
Experimental study of bank aerodynamics of atmospheric spray cooling systems, 3:44611 (COO-4531-1)

SPREAD F
Morphological studies of rising equatorial Spread F bubbles. Interim report, 3:45482 (AD-A-048752)

SPRINGS
(Mechanical springs only.)

SPRINGS/MECHANICAL PROPERTIES
Coal gasification valves: Phase II. Quarterly technical progress report, September 1977-November 1977 (High temperature), 3:44042 (FE-2355-2(Rev.E))

SPUTTERING/MEASURING METHODS
Application of torsion vacuum microbalance to sputtering yield measurement, 3:46133

SQUID DEVICES/USES
Recent advances in SQUID NMR techniques, 3:45138 (CONF-780339-3)

SRC PROCESS/PILOT PLANTS
Solvent refined coal (SRC) process operation of Solvent Refined Coal Pilot Plant, Wilsonville, Alabama. Quarterly technical progress report, April-June 1977, 3:44062 (FE-2270-24)
Solvent refined coal (SRC) process. Operation of solvent refined coal pilot plant at Wilsonville, Alabama. Monthly technical progress report, March 1978, 3:44063 (FE-2270-29)

STABILIZED SUPERCONDUCTORS/FABRICATION
Method for producing a stabilized electrical superconductor (Patent), 3:45143

STAINLESS STEEL-304/CORROSION
Sodium technology and cover gas seal development programs. Quarterly technical progress report, January-March 1978 (LMFBR), 3:44685 (AI-DOE-13231)

STAINLESS STEEL-304/CORROSION PROTECTION
Development and evaluation of high chromium weld deposited overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Technical status report, January 1-January 31, 1978, 3:45004 (TID-28288)

STAINLESS STEEL-304/PERMEABILITY
Tritium permeation through oxidized 304 and 316 stainless steel, 3:44694 (HEDL-SA-1326)

STAINLESS STEEL-304/THERMAL EXPANSION
Method for measurement of relative differences in thermal expansion coefficients (LWBR development program), 3:44698 (WAPD-TM-1134)

STAINLESS STEEL-304/THERMOELASTICITY
Thermal ratchetting tests of Type 304 stainless steel pipe: specimens TTT-1 and TTT-2, 3:45013 (ORNL-5386)

STAINLESS STEEL-310/CORROSION PROTECTION
Development and evaluation of high chromium weld deposited overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Technical status report, January 1-January 31, 1978, 3:45004 (TID-28288)

STAINLESS STEEL-310/OXIDATION
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)

STAINLESS STEEL-316/PERMEABILITY
Tritium permeation through oxidized 304 and 316 stainless steel, 3:44694 (HEDL-SA-1326)

STAINLESS STEELS
See also STAINLESS STEEL-304
STAINLESS STEEL-310
STAINLESS STEEL-316

STAINLESS STEELS/BOREHOLES
Optical inspection of small-diameter deep bores using rod optics with low-light television and still photography (For corrosion), 3:45224 (UCRL-52431)

STAINLESS STEELS/CLADDING
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)

STAINLESS STEELS/CORROSION RESISTANCE
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)

STAINLESS STEELS/PLASMA ARC WELDING
Evaluation of plasma arc welding capabilities and applications, 3:45134 (RFP-2722)

STAINLESS STEELS/PROTECTIVE COATINGS
X-ray photoelectron spectroscopy study of radiofrequency-sputtered titanium carbide, molybdenum carbide, and titanium boride coatings and their friction properties, 3:45066 (N-77-33348)

STANDING CROP
See BIOMASS

STAR ACCRETION/HYDROGEN IONS 1 PLUS
Role of the H_2^+ molecular ion in the formation of stars from hot matter with a primordial chemical composition, 3:45445
STAR EVOLUTION
See also STAR ACCRETION
STAR EVOLUTION/EQUATIONS OF STATE
Nuclear matter with the retention of neutrinos, 3:45449
STAR EVOLUTION/NEUTRINOS
Nuclear matter with the retention of neutrinos, 3:45449
STARCH/BIOSYNTHESIS
Enzymes and microorganisms in food industry waste processing and conversion to useful products: a review of the literature, 3:44388 (LBL-5962)
STARS
See also GIANT STARS
NEUTRON STARS
SUN
SUPERMASSIVE STARS
SUPERNOVAE
T TAURI STARS
STARS/PHOTOMETRY
Photometric study of the Orion OB 1 association. 3: subgroup analyses, 3:45439 (N-77-34062)
STATE GOVERNMENT/ENERGY CONSERVATION
Energy conservation: policy considerations for The States (Study by Council of State Governments), 3:44871
STATISTICAL MODELS/FUSION REACTIONS
Statistical-model analyses of heavy-ion-induced fusion reaction products, 3:45738
STEAM GENERATING HEAVY WATER REACTOR
See SGHWR REACTOR
STEAM GENERATORS
Dynamic simulation of a reboiler, 3:44664 (AECL-5680)
STEAM GENERATORS/DESIGN
Power plant (Patent), 3:44395
STEAM GENERATORS/LEAKS
Interim evaluation of Sodium-Water Reaction Test No. 1 data and comparison with TRANSWRAP analyses: Series I large leak test program, 3:44691 (GEFR-00027(L))
STEAM INJECTION/RESEARCH PROGRAMS
DEEP STEAM: Project 16 enhanced oil recovery. Quarterly report, October 1-December 31, 1977, 3:44153 (SAND-78-0313)
STEAM SYSTEMS/COMPARATIVE EVALUATIONS
HTGR steam cycle configuration evaluation report, 3:44658 (GA-A-14900)
STEELS
See also STAINLESS STEELS
STEELS/FRACTURE PROPERTIES
Analysis of the ductile-brittle transition temperature in Fe-binary alloys. Final report, May 1974-July 1977, 3:45015 (TID-28431)
STEELS/NEUTRON SPECTRA
Results of neutron propagation in steel sodium mixtures with various source spectra on Harmonie and Tapiro, 3:44704
STEELS/NEUTRON TRANSPORT
Coarse mesh algorithm to solve neutron transport equation in thick shields, 3:44767
STELLAR RADIATION/POLARIZATION
Origin of the intrinsic linear polarization of the optical emission of stars with infrared excesses, 3:45447
STELLARATORS/DIFFUSION
Effect of alternating electric fields on the diffusion of collisionless plasma in the Saturn stellarator, 3:45939
STELLARATORS/PLASMA DRIFT
Rotational transform angle of the stellarator field with twisted coils, 3:46097 (N-77-34016)
STELLARATORS/REVIEWS
Alternative approaches to plasma confinement, 3:46083 (N-77-34000)
Recent stellarator research, 3:46088
STF REACTOR/FUEL PINS
Physics analysis of an SFT fuel pin experiment in the ACPR, 3:44784 (SAND-77-1737)
STIRLING ENGINES/DESIGN
Thermodynamic engine used as a refrigerator or as a heat engine (Patent), 3:45243
STORAGE RINGS
See also PEP STORAGE RINGS
STORAGE RINGS/SYNCHROTRON RADIATION
Synchrotron radiation research: Recent developments, 3:45113
STOVES/THERMAL EFFICIENCY
Determination of the efficiency of the slow-burning stoves for solid fuels, 3:45232
STRAIN GAGES/CALIBRATION
Monitoring of prestressed concrete pressure vessels. 1. An overview of concrete embedment strain instrumentation and calibration test results for selected concrete embedment strain meters, 3:44761 (ORNL/TM-6191/V1)
STRANGE PARTICLES/PARTICLE PRODUCTION
Cross sections of strange particle production in π^- p interactions at 5 GeV/c, 3:45590
STRATIFIED CHARGE ENGINES/DESIGN
Internal combustion engine with air-fuel mixture compression (Patent), 3:44979
STRATOSPHERE/AIR POLLUTION
Relationships between removal processes and residence times for atmospheric pollutants, 3:45290 (CONF-780611-3)
STREAMS
See also RIVERS
STREAMS/GEOCHEMICAL SURVEYS
Multilaboratory analytical quality control for the hydrochemical and stream sediment reconnaissance (National Uranium Resource Evaluation (NURE)), 3:44213 (IS-4370)
STREAMS/POLLUTION
Environmental lead distribution in relation to automobile and mine and smelter sources, 3:45312
STRONG INTERACTIONS
See also HADRON-HADRON INTERACTIONS
STRONG INTERACTIONS/QUANTUM CHROMODYNAMICS
Toward a theory of the strong interactions, 3:45666
STRONTIUM/ABSORPTION SPECTRA
Atomic diamagnetism: Quasi Landau spectrum near the ionization threshold, 3:45509
STRONTIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
STRONTIUM/IONIZATION
Atomic diamagnetism: Quasi Landau spectrum near the ionization threshold, 3:45509
STRONTIUM/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
STRONTIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
STYRENE/DISTILLATION
Method for the separation of styrene from thermally cracked petroleum (Patent), 3:44173
STYRENE POLYMERS
See POLYSTYRENE
SU-2 GROUPS/SYMMETRY BREAKING
Spontaneous symmetry breaking and nonlinear invariant Lagrangians: Applications to SU(2) x U(1) and OSp(1/4), 3:45646
SU-3 GROUPS/IRREDUCIBLE REPRESENTATIONS
Note on recoupling coefficients for SU(3), 3:45810
SU-4 GROUPS/ELECTROMAGNETIC INTERACTIONS
Generalization of the electromagnetic current operator, 3:45647
SUBBITUMINOUS COAL/COKING
Research and development as an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels. Quarterly report, September-November 1977 (Tracer studies), 3:44060 (FE-1800-21)
SUDDEN IONOSPHERIC DISTURBANCE/TABLES
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
SULFATES/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
SULFOCYANIDES
See THIOCYANATES
SULFUR/PRODUCTION
Process for obtaining oil, gas, sulfur, and other products from oil shale (Patent), 3:44206
SULFUR/REMOVAL
Method to desulphurize coal (Patent), 3:44032
Research and development of an advanced process for the conversion of coal to synthetic gasoline and other distillate fuels. Annual report No. 1, May 1976-April 1977 and quarterly technical progress report No. 4, February 1977-April 1977, 3:44064 (FE-2306-12)
Study of coal preparation and cleaning: summary and results, 3:44122 (CONF-7710101-9)
SULFUR/SORPTION
Sorption phenomenon in the organics of bottom sediments (Mercury, sulfur), 3:45344
SULFUR 32/RANGE
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
SULFUR 32/STOPPING POWER
Ranges of projectiles with $8 < \text{or} = Z < \text{or} = 20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812

SULFUR 32 TARGET/PHOTONUCLEAR REACTIONS
Reactions induced in light nuclei by bremsstrahlung with maximum energies from 2 to 4.5 GeV, 3:45563
SULFUR 32 TARGET/PROTON REACTIONS
Isotopic dependence of the yield of ^{17}N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
SULFUR 34 TARGET/PROTON REACTIONS
Isotopic dependence of the yield of ^{17}N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
SULFUR COMPOUNDS/CORROSIVE EFFECTS
Sulfidation-resistant alloy for coal gasification service. Quarterly report, 1 June-31 August 1977, 3:45053 (FE-2299-15)
SULFUR COMPOUNDS/REMOVAL
Process for cleaning and removal of sulfur compounds from low Btu gases. Quarterly summary report, January-March 1978, 3:44031 (PNL-2040-9)
SULFUR DIOXIDE/AIR POLLUTION CONTROL
EPA alkali scrubbing test facility: advanced program. Progress report No. 3, February-November 1976, 3:44625 (PB-274544)
SULFUR DIOXIDE/BIOLOGICAL EFFECTS
Respiratory disease in children exposed to sulfur oxides and particulates. Doctoral thesis, 3:45422 (PB-274339)
SULFUR DIOXIDE/ECOLOGICAL CONCENTRATION
Air conservation. Volume 10, Number 6(56), 1976, 3:45310 (PB-276342-T/SL)
SULFUR DIOXIDE/MONITORING
The 1976 NRL air quality data. Final report, 3:45289 (AD-A-048750)
SULFUR FLUORIDES/AUGER EFFECT
Anomalous spectral and yield features of Auger emission from symmetric molecules, 3:45510
SULFUR FLUORIDES/EXCITATION
Effects of molecular rotation and vibration-rotation interaction on collisionless multiple-photon excitation of SF_6, 3:45546
SULFUR FLUORIDES/ROTATIONAL STATES
Effects of molecular rotation and vibration-rotation interaction on collisionless multiple-photon excitation of SF_6, 3:45546
Infrared spectroscopy in supersonic molecular beams: ν_3 band of SF_6 at 10.6 μm, 3:45503
SULFUR FLUORIDES/TRACER TECHNIQUES
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP-1469)
SULFUR FLUORIDES/VIBRATIONAL STATES
Effects of molecular rotation and vibration-rotation interaction on collisionless multiple-photon excitation of SF_6, 3:45546
Infrared spectroscopy in supersonic molecular beams: ν_3 band of SF_6 at 10.6 μm, 3:45503
SULFUR HYDRIDES
See HYDROGEN SULFIDES
SULFUR OXIDES/AIR POLLUTION CONTROL
Initial field test, systems engineering and econometric analysis of an advanced flue gas desulfurization process: SULF-X. Final report, 3:44624 (PB-274395)
SULFUR OXIDES/AUGER EFFECT
Anomalous spectral and yield features of Auger emission from symmetric molecules, 3:45510
SUN
See also SOLAR ATMOSPHERE
SUN/MAGNETIC FIELDS
Solar-geophysical data number 398, October 1977. Part I. (Prompt reports). Data for September 1977-August 1977, 3:45452 (PB-275858)
SUN/MICROWAVE RADIATION
Some polarization features of microwave bursts on the sun, 3:45462
SUN/RADIOWAVE RADIATION
Influence of plasma effects on the conditions for observing lines in the solar spectrum of radio emission, 3:45460
Interpretation of the polarized zebra structure in solar radio emission, 3:45461
SUPERCONDUCTING CABLES/ECONOMICS
Superconducting transmission: more power at half the cost, 3:44634
SUPERCONDUCTING CABLES/FEASIBILITY STUDIES
Superconducting transmission: more power at half the cost, 3:44634
SUPERCONDUCTING CABLES/STABILIZED SUPERCONDUCTORS
Method for producing a stabilized electrical superconductor (Patent), 3:45143
SUPERCONDUCTING COMPOSITES/FABRICATION
High-conductivity high-specific-heat copper for cryogenic applications, 3:45142
SUPERCONDUCTING FILMS/ELECTRIC CONDUCTIVITY
Voltage jumps in the current-voltage characteristics of superconductive channels, 3:45048
SUPERCONDUCTING FILMS/PHONONS
Distribution of nonequilibrium excitations and phonon generation in superconducting tunnel junctions, 3:45842
SUPERCONDUCTING GENERATORS/DESIGN
6250 kVA superconducting generator, 3:45140 (NP-23197)
Superconducting generator design. Final report, 3:45139 (EPRI-EL-577)
SUPERCONDUCTING GENERATORS/ECONOMICS
Superconducting generator design. Final report, 3:45139 (EPRI-EL-577)
SUPERCONDUCTING GENERATORS/FEASIBILITY STUDIES
Superconducting generator design. Final report, 3:45139 (EPRI-EL-577)
SUPERCONDUCTING GENERATORS/PERFORMANCE TESTING
6250 kVA superconducting generator, 3:45140 (NP-23197)
SUPERCONDUCTING GENERATORS/ROTORS
Rotor for a rotary electrical machine having a superconductive field winding (Patent), 3:45144
SUPERCONDUCTING JUNCTIONS/PHONONS
Distribution of nonequilibrium excitations and phonon generation in superconducting tunnel junctions, 3:45842
SUPERCONDUCTING MAGNETS
See also MAGNETIC ENERGY STORAGE
TNS engineering trade study analysis, 3:46084 (ORNL/Sub-7117/24)
SUPERCONDUCTING MAGNETS/SHIELDING
Optimal iron-water shields for fusion reactors, 3:46094
Shielding problems in the FINTOR design, 3:46093
SUPERCONDUCTING MAGNETS/STABILITY
Numerical study of normal-zone evolution and stability of composite superconductors, 3:45141
SUPERCONDUCTING MOTORS/ROTORS
Rotor for a rotary electrical machine having a superconductive field winding (Patent), 3:45144
SUPERCONDUCTIVITY/GREEN FUNCTION
Properties of superconducting microbridges in the pure limit, 3:45843
SUPERCONDUCTIVITY/STABILITY
Coexistence of the dielectric and superconducting states in quasi-one-dimensional systems, 3:45844
SUPERCONDUCTIVITY/TWO-DIMENSIONAL CALCULATIONS
Surface superconductivity in layered compounds, 3:45839
SUPERCONDUCTORS
See also STABILIZED SUPERCONDUCTORS
TYPE-II SUPERCONDUCTORS
SUPERCONDUCTORS/EDGE DISLOCATIONS
Electrostatic interaction between dislocations in a superconductor, 3:45841
SUPERCONDUCTORS/ELASTICITY
Single-crystal elastic constants of Al_2Cu, 3:45024
SUPERCONDUCTORS/ELECTRIC FIELDS
Electric field in gapless superconductors, 3:45847
SUPERCONDUCTORS/FERMI LEVEL
Influence of a change in the topology of the Fermi surface on the coefficient of ultrasound absorption in superconductors, 3:45849
SUPERCONDUCTORS/OPTICAL PUMPING
Theory of phase transitions in nonequilibrium superconductors with allowance for phonon reabsorption, 3:45838
SUPERCONDUCTORS/PHASE TRANSFORMATIONS
Theory of phase transitions in nonequilibrium superconductors with allowance for phonon reabsorption, 3:45838
SUPERCONDUCTORS/QUASI PARTICLES
Theory of phase transitions in nonequilibrium superconductors with allowance for phonon reabsorption, 3:45838
SUPERCONDUCTORS/SOUND WAVES
Raman sound scattering in normal metals and superconductors, 3:45848
SUPERCONDUCTORS/THERMOELECTRIC PROPERTIES
Thermoelectric effect in superconducting alloys with an ordered magnetic moment distribution, 3:45846
SUPERCONDUCTORS/TUNNEL EFFECT
Effect of resonance oscillations of the order parameter on the tunnel current in superconductors, 3:45840
SUPERCONDUCTORS/ULTRASONIC WAVES
Influence of a change in the topology of the Fermi surface on the coefficient of ultrasound absorption in superconductors, 3:45849
SUPERGRAVITY/GAUGE INVARIANCE
Gauge invariance in supergravitation, 3:45859
Nonlinear gauge fields and the structure of gravity and supergravity theories, 3:45653
SUPERGRAVITY/INSTANTONS
Local supersymmetry transformations and fermion solutions in the presence of instantons, 3:45667

SUPERMASSIVE STARS/NUCLEOSYNTHESIS
Explosive nucleosynthesis, equilibrium thermodynamics, and relativistic heavy-ion collisions, 3:45442
SUPERNOVAE/BRIGHTNESS
Light curves, color curves, and expansion velocity of type I supernovae as functions of the rate of brightness decline, 3:45446
SUPERNOVAE/STAR MODELS
Postmaximum phases of the light curves of type I supernovae, 3:45443
SURFACE AIR
See also AIR
EARTH ATMOSPHERE
SURFACE AIR/AIR POLLUTION
Relationships between removal processes and residence times for atmospheric pollutants, 3:45290 (CONF-780611-3)
SURFACE AIR/QUANTITATIVE CHEMICAL ANALYSIS
Feasibility study for computerized automation of EPA Region II Technical Support Branch, 3:45303 (UCRL-52426)
SURFACE MINING
See also OIL SHALE MINING
SURFACE MINING/ENVIRONMENTAL EFFECTS
Preparation, construction, and operation of a plant for recharging groundwater in the Halle Region, 3:44091
SURFACE MINING/FEASIBILITY STUDIES
Technical and economic feasibility of surface mining coal deposits, North Slope of Alaska. Final report, 3:44098 (PB-274373)
SURFACE MINING/GROUND WATER
Preparation, construction, and operation of a plant for recharging groundwater in the Halle Region, 3:44091
SURFACE MINING ACTS/ECONOMIC IMPACT
Energy and economic impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976). Final report, 3:44141 (PB-274632)
SURFACE MINING ACTS/REVIEWS
Energy and economic impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976). (appendices). Final report, 3:44142 (PB-274633)
SURFACE WATERS
See also COASTAL WATERS
ESTUARIES
LAKES
RIVERS
SEAS
STREAMS
WATER RESERVOIRS
SURFACE WATERS/POLLUTION
Role of hydrous metal oxides in the transport of heavy metals in the environment (Fe, Mn, Cu, Zn, Ni, Cd), 3:45345
SURFACE WATERS/QUANTITATIVE CHEMICAL ANALYSIS
Feasibility study for computerized automation of EPA Region II Technical Support Branch, 3:45303 (UCRL-52426)
SURFACE WATERS/RADIOACTIVITY
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
SURFACE WATERS/WATER POLLUTION
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
SURFACES
See also SPECTRALLY SELECTIVE SURFACES
SURFACES/SUPERCONDUCTIVITY
Surface superconductivity in layered compounds, 3:45839
SWIMMING POOLS/SENSIBLE HEAT STORAGE
System for storage and use of solar energy (Patent), 3:44505
SWIMMING POOLS/SOLAR WATER HEATING
System for storage and use of solar energy (Patent), 3:44505
SWITZERLAND/GEOPHYSICAL SURVEYS
Geothermal energy and the lithosphere in the south-west of FRG/Switzerland, 3:44585
SYNCHROTRON RADIATION/RESEARCH PROGRAMS
Synchrotron radiation research: Recent developments, 3:45113
SYNTHESIS GAS/METHANATION
Alloy catalysts with monolith supports for methanation of coal-derived gases. Quarterly technical progress report, September 20-December 20, 1977, 3:44048 (FE-2729-1)
SYNTHESIS GAS/PRODUCTION
Method to produce synthesis gas (Patent), 3:44332
SYNTHESIS GAS/SIMULATION
Liquid phase methanation pilot plant installation and operation. Quarterly report, October 1, 1976-December 31, 1976, 3:44039 (FE-2036-21)
SYNTHESIS GAS/SOOT
Method to produce synthesis gas (Patent), 3:44332
SYNTHETIC FUELS/BIOSYNTHESIS
Utilization of solar energy through photosynthesis and artificial water photolysis, 3:44389
SYNTHETIC FUELS/MARKET
System for projecting the utilization of renewable resources. SPURR methodology, 3:44348 (ERHQ/2322-77/4)
SYNTHETIC FUELS/REFINING
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, October-December 1977, 3:44208 (FE-2315-22)
SYNTHETIC FUELS/SYNTHESIS
Method and equipment for producing synthetic fuel from wastes (Patent), 3:44336

T

T TAURI STARS/STELLAR ATMOSPHERES
Models of the outflowing envelopes of T Tau stars, 3:45448
TANKS/CHEMICAL REACTIONS
Review of liquid-tank interaction analysis technique, 3:44293 (UCRL-13835)
TANKS/FAILURES
Environmental effects on metal structures and connection in NFS waste tanks, 3:44294 (UCRL-13837)
TANKS/MATERIALS TESTING
Evaluation of the integrity of existing NFS waste tanks, 3:44295 (UCRL-13839)
TANTALUM/ELECTRON EMISSION
Energy properties of radioactive electron emission from tantalum, 3:45038
TANTALUM/X-RAY SPECTRA
Precise measurements of Kα x-ray linewidths in Eu, Tm, and Ta, 3:45511
TANTALUM 181 TARGET/ALPHA REACTIONS
Correlated energy spectra of light fragments from 720-MeV α-induced reactions, 3:45715
TANTALUM OXIDES/ION SCATTERING ANALYSIS
Combined low-energy ion scattering and x-ray photoelectron spectroscopy study of Ta_2O_5 bombarded by 500-3000-eV He ions, 3:45063
TANTALUM OXIDES/PHOTOELECTRON SPECTROSCOPY
Combined low-energy ion scattering and x-ray photoelectron spectroscopy study of Ta_2O_5 bombarded by 500-3000-eV He ions, 3:45063
TARGETS/MANIPULATORS
Simple manipulator for rotating spheres, 3:46129
TAU PARTICLES/LEPTON NUMBER
Is the tau a paraelectron, 3:45621
TAU PARTICLES/LEPTONIC DECAY
Is the tau a paraelectron, 3:45621
Observartion of $\mu 3\pi$ events in $e^+ e^-$ annihilation, 3:45561
TAU PARTICLES/PARTICLE PRODUCTION
Observartion of $\mu 3\pi$ events in $e^+ e^-$ annihilation, 3:45561
TCT
See TWO-COMPONENT TORUS
TECHNETIUM/CHEMICAL REACTIONS
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
TECHNETIUM/ENVIRONMENTAL TRANSPORT
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
TECHNETIUM/PRECIPITATION
Selective separation of technetium, 3:45117 (UCRL-Trans-11365)
TECHNETIUM 99/RADIONUCLIDE KINETICS
Radionuclide computerized tomography for brain study, 3:45388
TECHNOLOGY TRANSFER/COMMUNICATIONS
Managing the flow of technology: technology transfer and the dissemination of technological information within the R and D organization (Book), 3:44866
TEMPERATURE MEASUREMENT/RADIOMETRIC GAGES
Formation temperature gauge feasibility study. Volume II (Neutron radiometric gauge), 3:44584 (SAN-0936P48-1)
TENNESSEE RIVER/POLLUTION
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
TENNESSEE VALLEY AUTHORITY/POWER GENERATION
Electric Utility Rate Design Study: how to quantify marginal costs, Topic 4 results for Tennessee Valley Authority, 3:44890 (NP-22554)
TENNESSEE VALLEY AUTHORITY/POWER TRANSMISSION
Electric Utility Rate Design Study: how to quantify marginal costs, Topic 4 results for Tennessee Valley Authority, 3:44890 (NP-22554)

TERBIUM/MAGNETIZATION
Effective fields at diamagnetic impurities in rare-earth metals, 3:45051
TERBIUM 159 TARGET/NEUTRON REACTIONS
Parameters of terbium neutron resonances, 3:45752
TERBIUM ALLOYS/MAGNETOSTRICTION
Effect of magnetically aligned powder on the magnetostriction of sintered rare earth-iron Laves phase compounds, 3:45022
TERBIUM COMPOUNDS/EXCHANGE INTERACTIONS
Characteristics of the contribution of Dy^3+ and Tb^3+ ions to the anisotropy of Dy/sub x/Tb/sub 1-x/FeO_3 orthoferrites, 3:45098
TERBIUM COMPOUNDS/MAGNETIZATION
Characteristics of the contribution of Dy^3+ and Tb^3+ ions to the anisotropy of Dy/sub x/Tb/sub 1-x/FeO_3 orthoferrites, 3:45098
TERBIUM FLUORIDES/MAGNETO-OPTICAL EFFECTS
Magneto-optical properties of KTb_3F_10 and $LiTbF_4$ crystals, 3:45090
TERRESTRIAL BACKGROUND
See BACKGROUND RADIATION
TEXAS/URANIUM DEPOSITS
Geostatistics Project of the National Uranium Resource Evaluation Program. Progress report, January-March 1978, 3:44216 (LA-7296-PR)
Uranium associated with iron-titanium oxide minerals and their alteration products in a south Texas roll-type deposit, 3:44219 (USGS-CIRC-753)
TEXT EDITORS/COMPUTER CODES
Data Director system manual, 3:46142 (UCID-17749)
TEXTILE INDUSTRY/SOLAR PROCESS HEAT
Process water heating by solar augmentation for the textile industry, 3:44457 (CONF-761220-)
TFTR REACTORS/VACUUM SYSTEMS
TFTR vacuum system, 3:46130
THALLIUM/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
THALLIUM 199/ENERGY LEVELS
Nuclear Data Sheets for A=199, 3:45756
THALLIUM 199/NUCLEAR STRUCTURE
Nuclear Data Sheets for A=199, 3:45756
THALLIUM 203/ENERGY LEVELS
Nuclear data sheets for A=203, 3:45757
THALLIUM 203/NUCLEAR STRUCTURE
Nuclear data sheets for A=203, 3:45757
THALLIUM COMPOUNDS/PHOTOLUMINESCENCE
Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals, 3:45084 (ANL-Trans-1130)
THALLIUM COMPOUNDS/POINT DEFECTS
Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals, 3:45084 (ANL-Trans-1130)
THALLIUM COMPOUNDS/TUNNEL EFFECT
Fractional photostimulated tunnel luminescence and its use in determining the spatial distribution of defects in alkali halide crystals, 3:45084 (ANL-Trans-1130)
THE NEXT STEP DEVICE
See TNS REACTORS
THERMAL DECOMPOSITION
See PYROLYSIS
THERMAL EFFICIENCY/MEASURING METHODS
Determination of the efficiency of the slow-burning stoves for solid fuels, 3:45232
THERMAL ENERGY STORAGE EQUIPMENT
Storage of solar energy in the ground, 3:44566
THERMAL ENERGY STORAGE EQUIPMENT/DESIGN
Conservation of electrical energy (Patent), 3:44621
THERMAL ENERGY STORAGE EQUIPMENT/LATENT HEAT STORAGE
Application of latent-heat storage element in solar-heated buildings, 3:44557
Energy cost reduction by latent heat buffers, 3:44844
Heat exchange processes for latent heat storage devices, 3:44845
Solar heating system for greenhouses using LAING latent-energy storages, 3:44568
THERMAL ENERGY STORAGE EQUIPMENT/PERFORMANCE
New type dual storage unit for solar water heating, 3:44464
THERMAL ENERGY STORAGE EQUIPMENT/PLANNING
Solar energy - competitive because of cascade batteries, 3:44567
THERMAL INSULATION/SPRAY COATING
Solar energy collecting device (Patent), 3:44513
THERMAL POLLUTION
(Environmental temperature rise due to waste heat disposal)
Supplement to effects of thermal discharges on physico-chemical processes and water quality, Vistula River, Poland. Final report, January 1973-December 1975, 3:45361 (PB-273580)
THERMAL POLLUTION/BIBLIOGRAPHIES
Thermal effects on aquatic organisms: an annotated bibliography of the 1976 literature, 3:45406 (ORNL/EIS-124)
THERMAL POLLUTION/BIOLOGICAL EFFECTS
Thermal effects on aquatic organisms: an annotated bibliography of the 1976 literature, 3:45406 (ORNL/EIS-124)
THERMAL POLLUTION/ENVIRONMENTAL EFFECTS
Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes, 3:45360 (ANL/WR-77-3)
THERMAL POLLUTION/MONITORING
Water resources research program. Thermal plumes from submerged discharges at Zion Nuclear Power Station: additional prototype measurements of interacting plumes, 3:45360 (ANL/WR-77-3)
THERMAL POWER PLANTS
See also GEOTHERMAL POWER PLANTS
THERMAL POWER PLANTS/COOLING SYSTEMS
Experimental study of bank aerodynamics of atmospheric spray cooling systems, 3:44611 (COO-4531-1)
Perspectives on fish impingement, 3:44622 (CONF-771231-3)
THERMAL POWER PLANTS/COOLING TOWERS
Large wet-type cooling towers and their influence on the environment, 3:44612
THERMAL POWER PLANTS/DISTRICT HEATING
Simultaneous generation of heat and electricity, 3:44394 (CONF-761220-)
THERMAL POWER PLANTS/ENERGY CONVERSION
Energy conversion system (Patent), 3:44609
THERMAL POWER PLANTS/ENVIRONMENTAL EFFECTS
Thermal effects on aquatic organisms: an annotated bibliography of the 1976 literature, 3:45406 (ORNL/EIS-124)
THERMAL POWER PLANTS/FLUE GAS
Waste flue gas desulfurizing method (Patent), 3:44626
THERMAL POWER PLANTS/GAS TURBINES
Parameter monitoring for corrosion control of utility gas turbines. Interim report, 3:44613 (EPRI-AF-665)
THERMAL POWER PLANTS/OFF-PEAK ENERGY STORAGE
Conservation of electrical energy (Patent), 3:44621
THERMAL POWER PLANTS/POWER GENERATION
Simultaneous generation of heat and electricity, 3:44394 (CONF-761220-)
THERMAL POWER PLANTS/PROCESS HEAT
Simultaneous generation of heat and electricity, 3:44394 (CONF-761220-)
THERMAL SPRINGS
See also HOT SPRINGS
THERMAL SPRINGS/GEOCHEMICAL SURVEYS
Guanacaste Geothermal Project. Technical prefeasibility report. Final report for Phase I, 3:44572 (NP-22850)
THERMAL SPRINGS/GEOCHEMISTRY
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
THERMAL WATERS/CHEMICAL COMPOSITION
Analysis of interrelation of hot spring waters using a multi-component concentration correlation matrix, 3:44574 (CONF-7610123-6)
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP-23013)
Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP-22298)
THERMIONIC CONVERTERS/CURRENT DENSITY
Current-density distribution in a long cylindrical thermionic converter, 3:44906
THERMIONIC CONVERTERS/ELECTRIC CONDUCTIVITY
Cesium-bismuth thermionic converter, 3:44905
THERMIONIC CONVERTERS/POWER
Cesium-bismuth thermionic converter, 3:44905
THERMIONIC REACTORS/REACTOR CONTROL SYSTEMS
Control for nuclear thermionic power source (Patent), 3:44774
THERMOCHEMICAL HEAT STORAGE/RESEARCH PROGRAMS
Thermochemical Energy Storage and Transport Program. Semiannual report, April 1977-September 1977, 3:44847 (SAND-77-8056)
THERMOELECTRIC GENERATORS/DESIGN
Thermo-electric generators (Patent; using sodium as heat transfer fluid), 3:44904
THERMOELECTRIC GENERATORS/SAFETY
Safety methodology for space nuclear systems. Final report, 3:44324 (AD-A-048780)

THERMOLUMINESCENT DOSEMETERS/EMISSION SPECTRA
Thermoluminescence of LiF TLD-100: Emission-spectra measurements, 3:45828
THERMOLUMINESCENT DOSEMETERS/REACTION KINETICS
Thermoluminescence of LiF TLD-100: Glow-curve kinetics, 3:45829
THERMONUCLEAR DEVICES
See also ASTRON
ORMAK DEVICES
STELLARATORS
TOKAMAK DEVICES
THERMONUCLEAR DEVICES/NEUTRAL ATOM BEAM INJECTION
Characterization of a laser-produced negative-hydrogen-ion plasma, 3:45911
THERMONUCLEAR FUELS/COMPRESSION
New lens system using toroidal magnetic field for intense ion beams, 3:46107 (N-77-33981)
THERMONUCLEAR FUELS/DESIGN
Thick-shell shock-focusing electron beam targets, 3:46112
THERMONUCLEAR FUELS/FABRICATION
Cryogenic microshell pellets and other advanced targets for laser fusion, 3:44318
Tritium handling and the preparation of DT-containing micro-targets for laser fusion experiments, 3:44319
THERMONUCLEAR FUELS/LASER IMPLOSIONS
Comments on the paper by K.A. Brueckner and R.S. Janda 'Wavelength dependence of laser coupling to pellet implosions' Nucl. Fusion 17(2) (1977) 305, 3:46111
Exploding pusher experiments utilizing a 4π illumination system, 3:46118
Laser driven compression and neutron generation with spherical shell targets, 3:46116
Laser fusion experiments at 2 TW, 3:46114
Reply by K.A. Brueckner on comments by E. Panarella on the paper 'Wavelength dependence of laser coupling to pellet implosions' by K.A. Brueckner and R.S. Janda, Nucl. Fusion 17(2) (1977) 305, 3:46110
THERMONUCLEAR FUELS/PERFORMANCE
D-^{3}He as a "clean" fusion reactor, 3:46104
THERMONUCLEAR FUELS/SHELLS
Thick-shell shock-focusing electron beam targets, 3:46112
THERMONUCLEAR REACTOR COOLING SYSTEMS
Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub-7117/25)
THERMONUCLEAR REACTOR MATERIALS/EROSION
Surface damage of molybdenum and TZM alloy under D^+ impact, 3:45060
THERMONUCLEAR REACTOR MATERIALS/SPUTTERING
Application of torsion vacuum microbalance to sputtering yield measurement, 3:46133
THERMONUCLEAR REACTOR WALLS
See also FIRST WALL
THERMONUCLEAR REACTOR WALLS/IMPURITIES
Kinetics of neutral atoms near the wall of a fusion reactor and impurity formation, 3:45967
THERMONUCLEAR REACTOR WALLS/SPUTTERING
Kinetics of neutral atoms near the wall of a fusion reactor and impurity formation, 3:45967
THERMONUCLEAR REACTORS
(For use in cases where certain aspects of either hypothetical or real thermonuclear reactors are discussed.)
DOUBLET REACTORS
See also D-T REACTORS
JT-60 REACTORS
LASER FUSION REACTORS
MAGNETIC MIRROR TYPE REACTORS
PLT REACTORS
TFTR REACTORS
THERMONUCLEAR REACTOR WALLS
TNS REACTORS
TOKAMAK TYPE REACTORS
Perspective of the energy policy for Europe: demands and recommendations concerning energy and research policy for overcoming the present stagnation, 3:44884
Who works with nuclear fusion technology. Demands of the technological development on the training, 3:46089
THERMONUCLEAR REACTORS/BEAM-PLASMA SYSTEMS
Transport studies of cusp and multichannel REB fusion concepts, 3:46108
THERMONUCLEAR REACTORS/COST BENEFIT ANALYSIS
Economics of fusion research, 3:46081 (COO-4181-1)
THERMONUCLEAR REACTORS/ECONOMIC ANALYSIS
Economics of fusion research, 3:46081 (COO-4181-1)
THERMONUCLEAR REACTORS/FUEL CYCLE
D-^{3}He as a "clean" fusion reactor, 3:46104
THERMONUCLEAR REACTORS/NEUTRAL ATOM BEAM INJECTION
Neutral-beam divergence due to imperfect magnetic shielding, 3:45880
Use of a Hall accelerator in the production of negative hydrogen ions in cesium vapor, 3:46106
THERMONUCLEAR REACTORS/NEUTRON FLUX
Simultaneous global calculation of flux and importance with forward Monte Carlo, 3:45820
THERMONUCLEAR REACTORS/NEUTRON TRANSPORT
Transport and reactor theory. Progress report, January 1-March 31, 1978, 3:44734 (LA-7271-PR)
THERMONUCLEAR REACTORS/Q-VALUE
Re-circulating power, unit costs and thermal pollution of fusion power stations, 3:46132
THERMONUCLEAR REACTORS/RESEARCH PROGRAMS
Status report on controlled thermonuclear fusion by International Fusion Research Council (IFRC), 3:46087
THERMONUCLEAR REACTORS/REVIEWS
Alternative approaches to plasma confinement, 3:46083 (N-77-34000)
Status report on controlled thermonuclear fusion by International Fusion Research Council (IFRC), 3:46087
THERMONUCLEAR REACTORS/THERMAL POLLUTION
Re-circulating power, unit costs and thermal pollution of fusion power stations, 3:46132
THERMONUCLEAR REACTORS/VACUUM SYSTEMS
Cryosorption pumping of deuterium by MS-5A at temperatures above 4.2 K for fusion reactor applications, 3:46131
THERMONUCLEAR WEAPONS
See NUCLEAR WEAPONS
THERMOPLASTICS/REMOVAL
N-methyl-2-pyrrolidone as a stripper for plastic potting compounds, 3:45228 (BDX-613-1955(Rev.))
THETA PINCH/DRIFT INSTABILITY
Particle simulation studies of the lower hybrid drift instability, 3:46005
Quasi-linear stabilization of lower-hybrid-drift instability, 3:45995
THETA PINCH/FLUTE INSTABILITY
Particle simulation studies of the lower hybrid drift instability, 3:46005
THETA PINCH/IMPLOSIONS
Calculations of the effects of incomplete preionization in high voltage theta pinches, 3:45879
THETA PINCH/IONIZATION
Calculations of the effects of incomplete preionization in high voltage theta pinches, 3:45879
THETA PINCH/LARMOR RADIUS
Finite Larmor radius equations in an arbitrary near-theta pinch geometry, 3:46001
THETA PINCH/MAGNETIC FIELD CONFIGURATIONS
Numerical computation of high-beta toroidal diffuse equilibria, 3:46100
THETA PINCH/PLASMA HEATING
Calculations of the effects of incomplete preionization in high voltage theta pinches, 3:45879
THETA PINCH/PLASMA SHEATH
Particle simulation studies of the lower hybrid drift instability, 3:46005
THETA PINCH/STABILIZATION
Finite Larmor radius equations in an arbitrary near-theta pinch geometry, 3:46001
THICKNESS GAGES/DESIGN
Card controlled beta backscatter thickness measuring instrument (Patent), 3:45264
THIO COMPOUNDS
See ORGANIC SULFUR COMPOUNDS
THIOCYANATES/BIODEGRADATION
Preliminary evaluation of the biological oxidation of thiocyanates. Progress report, November 30, 1977-February 28, 1978, 3:44085 (COO-4502-2)
THOMSON SCATTERING
Stimulated emission and absorption in classical systems, 3:45863
THORAX
See CHEST
THORIUM/CHEMISORPTION
Application of a double-pass CMA to ion scattering from some actinide materials, 3:45012
THORIUM/MEETINGS
Short papers of the U.S. Geological Survey uranium-thorium symposium, 1977 (Individual papers were indexed separately), 3:44217 (USGS-CIRC-753)
THORIUM/MUONIC ATOMS
Nuclear charge distributions deduced from the muonic atoms of ^{232}Th, ^{235}U, ^{238}U, and ^{239}Pu, 3:45766

THORIUM/RADIOMETRIC ANALYSIS
Examples of uranium distribution graphics in geologic rock specimens illustrated with the Radioluxograph, induced fission tracks, and other tracks methods, 3:44249 (USGS-CIRC-753)
THORIUM/SURFACE CLEANING
Auger study of surface carbon and oxygen on thorium following ion bombardment, 3:45031
THORIUM 232/CHARGE DISTRIBUTION
Nuclear charge distributions deduced from the muonic atoms of ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu, 3:45766
THORIUM 232 TARGET/NEUTRON REACTIONS
Review and combination of experimental results for neutron emission per fission of ^{232}Th (1 to 16 MeV), 3:45772 (ORNL/TM-6245)
THORIUM 233 TARGET/KRYPTON 86 REACTIONS
Coulomb-nuclear interference for high-spin states excited by ^{8}6Kr, ^{4}0Ar, and ^{1}6O projectiles, 3:45748
THORIUM 234/BETA-MINUS DECAY
Decay of ^{2}34Th to the ^{2}34Pa isomers, 3:45768
THORIUM ALLOYS/SPECIFIC HEAT
Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys, 3:45028
THORIUM ALLOYS/SUPERCONDUCTIVITY
Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys, 3:45028
THORIUM CARBIDES/PHYSICAL RADIATION EFFECTS
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978, 3:44657 (GA-A-14863)
THORIUM CYCLE/ECONOMICS
Economics and utilization of thorium in nuclear reactors, 3:44724 (ORNL/TM-6331)
THORIUM CYCLE/FEASIBILITY STUDIES
Economics and utilization of thorium in nuclear reactors, 3:44724 (ORNL/TM-6331)
THORIUM ORES/AUTORADIOGRAPHY
Examples of uranium distribution graphics in geologic rock specimens illustrated with the Radioluxograph, induced fission tracks, and other tracks methods, 3:44249 (USGS-CIRC-753)
THORIUM ORES/DELAYED NEUTRON ANALYSIS
Uranium and thorium distribution in continental tertiary rocks of the Cook Inlet Basin and some adjacent areas, Alaska, 3:44234 (USGS-CIRC-753)
THORIUM OXIDES/DIFFUSION
Electrotransport in a ceramic based on thorium oxide, 3:45072
THORIUM OXIDES/FABRICATION
Progress on sol-gel sphere-pac development, 3:44259 (CONF-780535-1)
THORIUM OXIDES/INHALATION
Lung tumors in rats on chronic inhalation of thorium dioxide, 3:45404 (ORNL-tr-4544)
THORIUM OXIDES/PHYSICAL RADIATION EFFECTS
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978, 3:44657 (GA-A-14863)
THREE-BODY PROBLEM/ASYMPTOTIC SOLUTIONS
Asymptotic behavior of partial amplitudes in three-particle reactions with rearrangement of particles, 3:45800
THREE-BODY PROBLEM/FADDEEV EQUATIONS
Faddeev's equations and the strong-coupling method, 3:45679
THREE-BODY PROBLEM/UNITARITY
Dispersion approach to the calculation of three-particle bound states and contributions of three-particle unitarity, 3:45677
THULIUM/OPTICAL PROPERTIES
Optical properties of thulium in the 0.06-4.9-eV energy range, 3:45040
THULIUM/PHOTOCONDUCTIVITY
Optical properties of thulium in the 0.06-4.9-eV energy range, 3:45040
THULIUM/X-RAY SPECTRA
Precise measurements of Kα x-ray linewidths in Eu, Tm, and Ta, 3:45511
THYMUS/BIOCHEMICAL REACTION KINETICS
Regulation of metabolism in rat thymic lymphocytes: involvement of mRNA in glucocorticoid action, energy metabolism in protein synthesis, and composition and function of the ribosomal dimer, 3:45375 (UR-3490-1379)
THYRISTORS/RESEARCH PROGRAMS
Light-fired thyristor development. Interim report, 3:44629 (EPRI-EL-776)
THYROID/RADIATION DOSES
Investigation into the occurrence of radioiodine in air, precipitation, grass, cow- and goat-milk following the Chinese atomic bomb test of September 26, 1976, 3:45318 (INEL-tr-29)
TIN/ELECTRIC CONDUCTIVITY
Voltage jumps in the current-voltage characteristics of superconductive channels, 3:45048
TIN/PENETRATION DEPTH
Temperature dependence of the nonequilibrium-field penetration depth in a superconductor, 3:45046
TIN/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
TIN/TRANSITION TEMPERATURE
Steplike structure produced on the superconducting transition of a tin film by microwave radiation, 3:45044
TIN 111/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
TIN 112 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
TIN 113/BETA-PLUS DECAY
Unified description of odd-mass indium nuclei I. General theory and comparison to ^{1}13In and ^{1}15In levels populated in the decay of ^{1}13Sn and ^{1}15Cd/sup m/,g, 3:45737
TIN 115/ENERGY-LEVEL TRANSITIONS
Inhibited electric-quadrupole transitions in odd-neutron spherical nuclei, 3:45731
TIN 116 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
TIN 118 TARGET/OXYGEN 18 REACTIONS
Optimum Q value in heavy-ion-induced neutron transfer at the Coulomb barrier, 3:45740
TIN 120 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
TIN 122 TARGET/TRITON REACTIONS
States of ^{1}22In and ^{1}24In, 3:45742
TIN 124/GIANT RESONANCE
Electroexcitation of giant multiple resonances in ^{6}4Zn and ^{1}24Sn nuclei, 3:45735
TIN 124 TARGET/CHLORINE 35 REACTIONS
Heavy-ion fusion based on the proximity potential and one-body friction, 3:45711
TIN 124 TARGET/ELECTRON REACTIONS
Electroexcitation of giant multiple resonances in ^{6}4Zn and ^{1}24Sn nuclei, 3:45735
TIN 124 TARGET/KRYPTON 86 REACTIONS
Measurement of the energy division versus mass in highly damped reactions, 3:45746
TIN 124 TARGET/TRITON REACTIONS
States of ^{1}22In and ^{1}24In, 3:45742
TIN ALLOYS/AGE HARDENING
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
TIN ALLOYS/ENERGY SPECTRA
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
TIN ALLOYS/FRACTURE PROPERTIES
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
TIN ALLOYS/HOT PRESSING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
TIN ALLOYS/MICROSTRUCTURE
Some observations on the structure of Ti-11.5Mo-6Zr-4.5Sn (beta III) as affected by processing history. Technical report, 3:45007 (AD-A-048772)
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
TIN ALLOYS/OPTICAL PROPERTIES
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
TIN ALLOYS/SUPERCONDUCTIVITY
Critical-current changes in neutron-irradiated Nb_3Sn as a function of irradiation temperature and initial metallurgy, 3:45057
Superconducting properties of in situ prepared Nb-Cu-Sn alloys, 3:45021
TIN ALLOYS/WELDING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)

TIN ISOTOPES/PROTON REACTIONS
Isotopic dependence of the yield of ^{17}N nuclei from targets of the isotopes of Mg, S, Ca, Ni, and Sn, 3:45580
TIN TELLURIDES/SPUTTERING
Thin film photovoltaic diodes and method for making same (Patent), 3:44379
TITANIUM/CHARGED-PARTICLE TRANSPORT
Ranges of projectiles with $8< or =Z< or =20$ in Ti, Fe, Ni, Cu, Ag, and Au for energies of 0.0125 to 12.0 MeV/nucleon, 3:45812
TITANIUM/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
TITANIUM 43/GAMMA CASCADES
Lifetime and γ decay of the isomeric $19/2^-$ state in ^{43}Ti, 3:45722
TITANIUM 46/ENERGY LEVELS
Nuclear data sheets for A=46, 3:45723
TITANIUM 46/ENERGY-LEVEL TRANSITIONS
Nuclear data sheets for A=46, 3:45723
TITANIUM ALLOYS
See also ALLOY-TZM
TITANIUM BASE ALLOYS
TITANIUM ALLOYS/MICROSTRUCTURE
Some observations on the structure of Ti-11.5Mo-6Zr-4.5Sn (beta III) as affected by processing history. Technical report, 3:45007 (AD-A-048772)
TITANIUM BASE ALLOYS/AGE HARDENING
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
TITANIUM BASE ALLOYS/FORGING
Investigation of separation-lubrication substances for use in isothermal forging. Final report, 16 December 1974-1 July 1976 (Ti-6Al-4V, 1300F to 1800F), 3:45002 (AD-A-048588)
TITANIUM BASE ALLOYS/FRACTURE PROPERTIES
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
TITANIUM BASE ALLOYS/HOT PRESSING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
TITANIUM BASE ALLOYS/MICROSTRUCTURE
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
TITANIUM BASE ALLOYS/WELDING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
TITANIUM BORIDES/SPUTTERING
X-ray photoelectron spectroscopy study of radiofrequency-sputtered titanium carbide, molybdenum carbide, and titanium boride coatings and their friction properties, 3:45066 (N-77-33348)
TITANIUM CARBIDES/SPUTTERING
X-ray photoelectron spectroscopy study of radiofrequency-sputtered titanium carbide, molybdenum carbide, and titanium boride coatings and their friction properties, 3:45066 (N-77-33348)
TITANIUM CHLORIDES/INFRARED SPECTRA
Absolute integrated intensities of the infrared absorption bands of $TiCl_4$, 3:45491
TITANIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
TITANIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
TITRATION
Titrimetry is alive and well at LLL, 3:45110 (UCRL-80878)
TNS REACTORS/DESIGN
Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub-7117/25)
TNS REACTORS/SCALING LAWS
TNS engineering trade study analysis, 3:46084 (ORNL/Sub-7117/24)
TNS REACTORS/SUPERCONDUCTING MAGNETS
TNS engineering trade study analysis, 3:46084 (ORNL/Sub-7117/24)
TOKAMAK DEVICES
See also ATC DEVICES
JFT-2 TOKAMAK
TWO-COMPONENT TORUS
TOKAMAK DEVICES/ALFVEN WAVES
Observation of nonelectrostatic rf noise in the T-4 tokamak, 3:46070
TOKAMAK DEVICES/DRIFT INSTABILITY
Gradient B drift instability in toroidal systems, 3:46030
TOKAMAK DEVICES/ELECTRIC CURRENTS
Neoclassical current in a toroidally-confined multispecies plasma, 3:45953
TOKAMAK DEVICES/ELECTROMAGNETIC RADIATION
Mechanism for the ω/sub p/e radiation in Tokamaks, 3:45886
TOKAMAK DEVICES/ELECTRON SPECTRA
Behavior of superthermal electrons in the scrape-off layer of DIVA, 3:45938
TOKAMAK DEVICES/EQUILIBRIUM
Bifurcated tokamak equilibria related to the shrinking and the disruption of the current, 3:46101
TOKAMAK DEVICES/GAS INJECTION
Fast hydrogen gas injection system for plasma physics experiments, 3:45869
TOKAMAK DEVICES/HYDROGEN
Use of the method of resonance fluorescence with a dye laser for plasma diagnostics in the FT-1 tokamak installation, 3:45917
TOKAMAK DEVICES/IMPURITIES
Laser-induced desorption of impurities from the macrotor tokamak walls, 3:45885
O-H charge exchange in cold, dense hydrogen plasmas, 3:45959
Observation of x-ray spectra of chromium and iron in the plasma of the "tokamak-10", 3:45916
TOKAMAK DEVICES/KINK INSTABILITY
Possible feedback suppression of the tearing-mode instability in a tokamak, 3:45897
TOKAMAK DEVICES/MAGNETIC FIELD CONFIGURATIONS
Bifurcated tokamak equilibria related to the shrinking and the disruption of the current, 3:46101
Influence of error fields on the plasma confining field and the plasma confinement in tokamak, 3:46096 (JAERI-M-7103)
Numerical computation of high-beta toroidal diffuse equilibria, 3:46100
TOKAMAK DEVICES/MICROWAVE RADIATION
Plasma diagnostic by the "two-beam" method, 3:45924
TOKAMAK DEVICES/NEUTRAL ATOM BEAM INJECTION
Effect of neutral injection on impurity diffusion in a collisional tokamak, 3:45970
TOKAMAK DEVICES/PLASMA CONFINEMENT
Influence of error fields on the plasma confining field and the plasma confinement in tokamak, 3:46096 (JAERI-M-7103)
TOKAMAK DEVICES/PLASMA DIAGNOSTICS
Observation of x-ray spectra of chromium and iron in the plasma of the "tokamak-10", 3:45916
Use of the method of resonance fluorescence with a dye laser for plasma diagnostics in the FT-1 tokamak installation, 3:45917
TOKAMAK DEVICES/PLASMA DRIFT
Toroidal mode coupling effects on drift wave stability, 3:45994
TOKAMAK DEVICES/PLASMA HEATING
Empirical tokamak scaling, 3:45891
TOKAMAK DEVICES/PLASMA MACROINSTABILITIES
Hydromagnetic stability of tokamaks, 3:46012
Theory of hydromagnetic stability of a tokamak plasma, 3:46013
TOKAMAK DEVICES/PLASMA WAVES
Interaction of lower hybrid waves with turbulent tokamak plasma, 3:46047
TOKAMAK DEVICES/RUNAWAY ELECTRONS
Behavior of superthermal electrons in the scrape-off layer of DIVA, 3:45938
Diagnostics of beams of accelerated (runaway) electrons in tokamaks, 3:45923
Kinetic theory of runaway electron beam instability in a tokamak, 3:46010
TOKAMAK DEVICES/SCALING LAWS
Empirical tokamak scaling, 3:45891
TOKAMAK DEVICES/SHEAR
Toroidal mode coupling effects on drift wave stability, 3:45994
TOKAMAK DEVICES/TRANSPORT THEORY
Multigroup calculations of low-energy neutral transport in tokamak plasmas, 3:45960
TOKAMAK DEVICES/TRAPPED ELECTRONS
Toroidal mode coupling effects on drift wave stability, 3:45994
TOKAMAK DEVICES/TRAPPED-PARTICLE INSTABILITY
Numerical study of the dissipative trapped-electron instability in tokamaks, 3:45890
Trapped electron instability in tokamaks: Analytic solution of the two-dimensional eigenvalue problem, 3:45877
TOKAMAK DEVICES/X-RAY DETECTION
Experimental device for the X-ray energetic distribution measurement in a tokamak plasma, 3:45903 (JEN-390)

TOKAMAK TYPE REACTORS
See also DOUBLET REACTORS
JT-60 REACTORS
PLT REACTORS
TFTR REACTORS
TNS REACTORS
TOKAMAK TYPE REACTORS/ALFVEN WAVES
Theory of "drift" thermonuclear instabilities in a tokamak reactor, 3:46014
TOKAMAK TYPE REACTORS/ELECTRIC DISCHARGES
Study on rf voltage breakdown for LHRH in 0.8 to 0.9 GHz, 3:45934 (N-77-33998)
TOKAMAK TYPE REACTORS/GAS BLANKETS
Possibility of wall-protecting cold-plasma layer formation in a tokamak reactor, 3:46092
TOKAMAK TYPE REACTORS/MAINTENANCE
Repair/maintenance design for tokamak fusion power reactor, 3:46126 (JAERI-M-7198)
TOKAMAK TYPE REACTORS/REVIEWS
Alternative approaches to plasma confinement, 3:46083 (N-77-34000)
TOKAMAK TYPE REACTORS/SHIELDING
Optimal iron-water shields for fusion reactors, 3:46094
Shielding problems in the FINTOR design, 3:46093
TOMOGRAPHY/DIAGNOSTIC TECHNIQUES
Analytical study of a high-resolution positron ring detector system for transaxial reconstruction tomography, 3:45389
Radionuclide computerized tomography for brain study, 3:45388
TOMOGRAPHY/EQUIPMENT
Device for measuring radiation absorption in a layer of a body (Patent), 3:45272
Fan beam x- or γ-ray 3-D tomography (Patent), 3:45273
TOMOGRAPHY/IMAGES
Circular ring transverse axial positron camera, 3:45390
Reconstruction tomography in diagnostic radiology and nuclear medicine (Book), 3:45382
Some performance and design characteristics of PETT III, 3:45383
TOROIDAL PINCH DEVICES/DRIFT INSTABILITY
Influence of magnetic shear on the lower-hybrid-drift instability in toroidal reversed-field pinches, 3:46003
TOWER FOCUS POWER PLANTS/TEST FACILITIES
Heliostat structural stability as a function of solat heating and ambient temperature changes, 3:44398 (CONF-761220-)
TRACER TECHNIQUES/COMPARATIVE EVALUATIONS
Heavy methane-SF_6 tracer test conducted at the Savannah River Plant, December 10, 1975, 3:45291 (DP-1469)
TRAINS
See also ELECTRIC RAILWAYS
TRAINS/IMPACT SHOCK
Cargo response to railcar impact and tiedown load analysis, 3:45152 (LA-UR-78-1210)
TRANSALASKA PIPELINE
See ALASKA OIL PIPELINE
TRANSFER (MASS)
See MASS TRANSFER
TRANSFORMERS/CALIBRATION
Prototype field calibration system for coupling capacitor voltage transformers (CCVTs). Final report, 3:44631 (EPRI-EL-690)
TRANSLATORS
LCL: a compiler and language for logical mask checking, 3:45229 (SAND-77-2031)
TRANSPORTATION SECTOR/ENERGY DEMAND
Analysis of the final energy demand in individual demand sectors and projection of its future development (German Federal Republic), 3:44881
TRANSPORTATION SYSTEMS
Cargo-Restraint-Transporter (CRT): a novel approach to the handling of cargo on DOE's Safe-Secure Trailers (SST), 3:44274 (Y/OA-2034)
TRANSPORTATION SYSTEMS/SYSTEMS ANALYSIS
Current status and future considerations for a transportation system for spent fuel and radioactive waste, 3:44275 (Y/OWI/SUB-77/42513)
TRAPPED-PARTICLE INSTABILITY/NONLINEAR PROBLEMS
Turbulence theory for the dissipative trapped electron instability, 3:45998
TRAPPED-PARTICLE INSTABILITY/NUMERICAL SOLUTION
Numerical study of the dissipative trapped-electron instability in tokamaks, 3:45890
TRAPPED-PARTICLE INSTABILITY/TURBULENCE
Turbulence theory for the dissipative trapped electron instability, 3:45998
TRAPPED-PARTICLE INSTABILITY/TWO-DIMENSIONAL CALCULATIONS
Trapped electron instability in tokamaks: Analytic solution of the two-dimensional eigenvalue problem, 3:45877
TRI-GAS PROCESS/PROCESS DEVELOPMENT UNITS
Gas generator research and development: TRI-GAS process. Volume II. Appendix. Sections I through V. Final report, August 21, 1973-October 20, 1977 (Design drawings only), 3:44035 (FE-1527-43(Vol.2))
Gas generator research and development: TRI-GAS process. Volume III. Appendix. Sections VI through XIV. Final report, August 21, 1973-October 20, 1977 (Design drawings, photographs and specifications only), 3:44036 (FE-1527-43(Vol.3))
TRINO VERCELLESE REACTOR
See SELNI REACTOR
TRIPLET PARTICLES
See QUARKS
TRITIUM/ABUNDANCE
Guanacaste Geothermal Project. Technical prefeasibility report. Annex B. Geochemistry, 3:44589 (NP-23013)
TRITIUM/BREEDING
Calculation of the influence of a thermal shield on the neutron flux and on the tritium production in a fusion reactor blanket, 3:46090 (HMI-B-235)
TRITIUM/CHARGE DISTRIBUTION
Charge asymmetry in ^{3}He-^{3}H and the neutron-proton mass difference, 3:45683
TRITIUM/DIFFUSION
Tritium permeation through oxidized 304 and 316 stainless steel, 3:44694 (HEDL-SA-1326)
TRITIUM/DUAL TEMPERATURE PROCESS
Hydrogen isotope exchange in metal hydride columns, 3:45122 (BNL-50755)
TRITIUM/MASS
Nonlocal contributions to the rho-ω mixing charge-symmetry-breaking force, 3:45682
TRITIUM/MATERIALS HANDLING
Four ignition TNS tokamak reactor systems: design summary, 3:46085 (ORNL/Sub-7117/25)
Tritium handling and the preparation of DT-containing micro-targets for laser fusion experiments, 3:44319
TRITIUM/NUCLEAR STRUCTURE
Charge asymmetry in ^{3}He-^{3}H and the neutron-proton mass difference, 3:45683
TRITIUM/PLASMA EXPANSION
Optimum parameters of a dense freely expanding deuterium-tritium plasma, 3:45972
TRITIUM/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
TRITIUM/RADIOECOLOGICAL CONCENTRATION
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
TRITON REACTIONS/CHARGE-EXCHANGE REACTIONS
States of ^{122}In and ^{124}In, 3:45742
TRITON REACTIONS/FISSION
Yet more complexity in fission: Barriers for nuclei with N = 150-154, 3:45776
TRITON REACTIONS/STRIPPING
(t,p) reactions on ^{4}He, ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, and ^{12}C, 3:45705
Core excited T = 2 levels in A = 12 from studies of ^{12}Be, 3:45698
TRITON REACTIONS/TWO-NUCLEON TRANSFER REACTIONS
^{14}C(t,p)^{16}C reaction at 23 MeV, 3:45692
TRITONS/MAGNETIC MOMENTS
NMR determination of the triton-proton magnetic moment ratio to within 10^{-6}%, 3:45517
TROILITE
See IRON METEORITES
TUBES
(For objects of tubular shape; not for DRIFT TUBES, ELECTRON TUBES or IMAGE STORAGE TUBES.)
TUBES/ELECTROMAGNETIC TESTING
Electromagnetic methods for inspection of ferrous tubing, 3:45222 (BN-SA-311)
TUBES (CONDUITS)
See PIPES
TUMORS
See NEOPLASMS
TUNGSTEN/ADSORPTION
Adsorption of lanthanum on the (100) face of a tungsten single crystal, 3:45036

TUNGSTEN/ADSORPTION HEAT
Adsorption of lanthanum on the (100) face of a tungsten single crystal, 3:45036
TUNGSTEN/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
TUNGSTEN/CHEMISORPTION
Effect of primary ion energy and surface chemistry on the secondary ion yields in low-energy SIMS experiments, 3:45030
TUNGSTEN/ELECTRIC IMPEDANCE
High-frequency conductivity of thin single-crystal tungsten wafers in a strong magnetic field, 3:45050
TUNGSTEN/MAGNETORESISTANCE
High-frequency conductivity of thin single-crystal tungsten wafers in a strong magnetic field, 3:45050
TUNGSTEN/PHYSICAL RADIATION EFFECTS
Direct observation of the point-defect structure of depleted-zones in ion-irradiated metals, 3:45055 (COO-3158-62)
TUNGSTEN/PION MINUS REACTIONS
Production of J/Psi particles by 43-GeV/c π^- mesons on the nuclei Be, Cu, and W, 3:45586
TUNGSTEN/TOXICITY
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume I. Executive summary. Final report, May 1974-April 1977, 3:45300 (PB-276169)
TUNGSTEN/WORK FUNCTIONS
Adsorption of lanthanum on the (100) face of a tungsten single crystal, 3:45036
TUNGSTEN 182 TARGET/CARBON 12 REACTIONS
Energy and spin dependence of fission: ^{1}H and ^{4}He emission from ^{1}94Hg compound nuclei, 3:45751
TUNGSTEN BASE ALLOYS/ENERGY SPECTRA
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
TUNGSTEN BASE ALLOYS/OPTICAL PROPERTIES
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
TUNGSTEN OXIDES/CRYSTAL STRUCTURE
Electronic properties of transition metal dioxides, 3:45073
TUNGSTEN OXIDES/ELECTRONIC STRUCTURE
Electronic properties of transition metal dioxides, 3:45073
TUNGSTEN OXIDES/ENERGY SPECTRA
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
TUNGSTEN OXIDES/FERMI LEVEL
Electronic properties of transition metal dioxides, 3:45073
TUNGSTEN OXIDES/OPTICAL PROPERTIES
Inelastic electron scattering by intra- and interband plasmons in rhenium trioxide, tungsten trioxide, and some tungsten bronzes, 3:45103
TURBINE BLADES/CORROSION
High temperature gas turbine engine component materals testing program. Task I. Quarterly technical progress report, October 1-December 30, 1977, 3:44615 (FE-1765-42)
TURBULENT HEATING/ION ACOUSTIC WAVES
Measurements of dispersion relation of waves in a turbulently heated plasma by microwave scattering method, 3:46035 (IPPJ-291)
TURKEY/INSOLATION
Utilization of solar energy for cooling and drying systems, 3:44467 (CONF-761220-)
TURNOVER (RADIONUCLIDES)
See RADIONUCLIDE KINETICS
TWO-COMPONENT TORUS/ALFVEN WAVES
Evolution of slightly localized Alfven quasimodes in a two-component tokamak, 3:46059
Suppression of the Alfven instability in a two-component tokamak of noncircular cross section, 3:46060
TWO-PHASE FLOW/CALCULATION METHODS
Characteristics and stability analyses of transient one-dimensional two-phase flow equations and their finite difference approximations, 3:44820
TWO-PHASE FLOW/MEASURING METHODS
Two-phase flow measurement by radioactive tracer techniques, 3:44798 (CONF-771126-8)
TWO-PHASE FLOW/PRESSURE GRADIENTS
Two-phase liquid-metal MHD generator experiments and pressure-gradient correlations, 3:44902 (CONF-780336-1)
TWO-STREAM INSTABILITY
Computation of two-stream explosive instability including harmonics generation and distribution function evolution, 3:46007
TWO-STREAM INSTABILITY/**INSTABILITY GROWTH RATES**
Current-driven instabilities in a laminar perpendicular shock, 3:45488
TYPE-II SUPERCONDUCTORS/CHEMICAL PREPARATION
Multisource deposition rate control using a mass spectrometer as a sensing element, 3:45006
TYPE-II SUPERCONDUCTORS/**CRITICAL CURRENT**
Critical currents of a one-dimensional array of superconducting vortices in a periodic pinning potential, 3:45845 (IS-M-137)
TYPE-II SUPERCONDUCTORS/**ELECTRIC IMPEDANCE**
Impedance of type II superconductors in the Shubnikov phase, 3:45850
TYPE-II SUPERCONDUCTORS/**PHYSICAL RADIATION EFFECTS**
Critical-current changes in neutron-irradiated Nb_3Sn as a function of irradiation temperature and initial metallurgy, 3:45057
TYPE-III SUPERCONDUCTORS
See TYPE-II SUPERCONDUCTORS

U

U-1 GROUPS/SYMMETRY BREAKING
Spontaneous symmetry breaking and nonlinear invariant Lagrangians: Applications to SU(2) x U(1) and OSp(1/4), 3:45646
UCLBL
See LAWRENCE BERKELEY LABORATORY
UINTA BASIN/NATURAL GAS WELLS
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
UNDERGROUND EXPLOSIONS
See also NUCLEAR EXPLOSIONS
SEISMIC S WAVES
UNDERGROUND EXPLOSIONS/**GROUND MOTION**
Periods of surface waves (Criteria for identification of underground explosions based on predominant period of surface waves in comparison with earthquakes), 3:45407 (UCRL-Trans-11366)
UNDERGROUND HEAT DISTRIBUTION SYSTEMS
See HEAT DISTRIBUTION SYSTEMS
UNDERGROUND MINING
See also LONGWALL MINING
OIL SHALE MINING
ROOM AND PILLAR MINING
UNDERGROUND MINING/**AUTOMATION**
Electrical equipment for roller conveyors, 3:44102
UNDERGROUND MINING/**CUTTER LOADERS**
Electrical equipment for roller conveyors, 3:44102
UNDERGROUND MINING/**EXHAUST SYSTEMS**
Method and device for cleaning underground cavities, especially in bituminous coal mining (Patent), 3:44120
UNDERGROUND MINING/**MINING EQUIPMENT**
Working the Threequarter seam at Markham colliery, with particular reference to the conveyor-mounted trepanner, 3:44104
UNDERGROUND MINING/**ROCK MECHANICS**
Slice working of thick seams as a function of rock pressure, 3:44114
UNIFIED GAUGE MODELS
See also WEINBERG-SALAM GAUGE MODEL
UNIFIED GAUGE MODELS/**NEUTRAL-CURRENT INTERACTIONS**
Symmetry breaking and naturalness of parity conservation in weak neutral currents in left-right-symmetric gauge theories, 3:45649
UNIFIED GAUGE MODELS/**SU-3 GROUPS**
SU(3) x U(1) gauge theory of weak and electromagnetic interactions, 3:45601
UNIFIED GAUGE MODELS/**SYMMETRY BREAKING**
Structure of elementary particles and relationships between the different forces of nature, 3:45597
UNIFIED GAUGE MODELS/**U-1 GROUPS**
SU(3) x U(1) gauge theory of weak and electromagnetic interactions, 3:45601
UNIFIED MODEL
Unified description of odd-mass indium nuclei I. General theory and comparison to ^{1}13In and ^{1}15In levels populated in the decay of ^{1}13Sn and ^{1}15Cd/sup m/,g, 3:45737
UNIPOLAR TRANSISTORS
See FIELD EFFECT TRANSISTORS
UNITED KINGDOM/COAL INDUSTRY
Coal on the switchback: the coal industry since nationalisation (Book), 3:44886

UNITED KINGDOM/ENERGY CONSERVATION
Advisory Council on Energy Conservation. Paper 5. Road vehicle and engine design: short- and medium-term energy considerations (Monograph), 3:44873
UNITED KINGDOM/ENERGY CONSUMPTION
Digest of United Kingdom energy statistics, 1977 (Monograph), 3:44896
UNITED KINGDOM/ENERGY SUPPLIES
Digest of United Kingdom energy statistics, 1977 (Monograph), 3:44896
UNITED STATES OF AMERICA
See USA
UNIVERSE/NUCLEOSYNTHESIS
Explosive nucleosynthesis, equilibrium thermodynamics, and relativistic heavy-ion collisions, 3:45442
UPSILON RESONANCES/LEPTONIC DECAY
Implications of the Y (9.5) for gauge theories of weak interactions, 3:45620
UPSILON RESONANCES/PARTICLE PRODUCTION
Hadronic Y production, parton distributions, and quantum chromodynamics, 3:45593
URANINITES/CHEMICAL COMPOSITION
Characterization of fine-grained black uranium ores by transmission electron microscopy, 3:44248 (USGS-CIRC-753)
URANINITES/CRYSTAL STRUCTURE
Characterization of fine-grained black uranium ores by transmission electron microscopy, 3:44248 (USGS-CIRC-753)
URANIUM
See also ENRICHED URANIUM
URANIUM/AVAILABILITY
Foreign uranium supply. Final report (1980-1995), 3:44276 (EPRI-EA-725)
URANIUM/BIOLOGICAL EFFECTS
Effect of some metals (Rb, Cs, Ag, Tl, Sb, U) on metallothionein level in the liver and kidneys of the rat (^{203}Hg), 3:45420 (ORNL-tr-4594)
URANIUM/CHEMISORPTION
Application of a double-pass CMA to ion scattering from some actinide materials, 3:45012
URANIUM/IMPORTS
Foreign uranium supply. Final report (1980-1995), 3:44276 (EPRI-EA-725)
URANIUM/MEETINGS
Short papers of the U.S. Geological Survey uranium-thorium symposium, 1977 (Individual papers were indexed separately), 3:44217 (USGS-CIRC-753)
URANIUM/MUONIC ATOMS
Nuclear charge distributions deduced from the muonic atoms of ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu, 3:45766
URANIUM/NEUTRON TRANSPORT
Sensitivity analysis for shielding data evaluation by interactive graphics computing, 3:45823
URANIUM/RADIOMETRIC ANALYSIS
Examples of uranium distribution graphics in geologic rock specimens illustrated with the Radioluxograph, induced fission tracks, and other tracks methods, 3:44249 (USGS-CIRC-753)
URANIUM/X-RAY FLUORESCENCE ANALYSIS
Interpretation of uranium content of ground water in west-central Kansas, 3:44231 (USGS-CIRC-753)
URANIUM 233/SELF-DIFFUSION
Self-diffusion processes in nuclear carbonitrides UC/sub x/N/sub 1-x/ and (U,Pu)$C_{0.8}N_{0.2}$, 3:45091
URANIUM 233 TARGET/ALPHA REACTIONS
Fission-evaporation competition in Pu isotopes of mass 235-239, 3:45763
URANIUM 233 TARGET/NEUTRON REACTIONS
General correlation for independent fission product yield uncertainties, 3:45774
URANIUM 234 TARGET/ALPHA REACTIONS
Fission-evaporation competition in Pu isotopes of mass 235-239, 3:45763
URANIUM 235/CHARGE DISTRIBUTION
Nuclear charge distributions deduced from the muonic atoms of ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu, 3:45766
URANIUM 235/LASER ISOTOPE SEPARATION
Apparatus for extraction and separation of a preferentially photo-dissociated molecular isotope into positive and negative ions by means of an electric field (Patent), 3:44258
URANIUM 235/SEPARATION NOZZLE METHOD
Physics of uranium-235-enrichment in the separation nozzle process. IV. Separation nozzle with double flow deflection and triple stream splitting, 3:44257
URANIUM 235 TARGET/ALPHA REACTIONS
Fission-evaporation competition in Pu isotopes of mass 235-239, 3:45763
URANIUM 235 TARGET/NEUTRON REACTIONS
Fission product yields from 6-9 MeV neutron-induced fission of ^{2}35U and ^{2}38U, 3:45777
General correlation for independent fission product yield uncertainties, 3:45774
Measurement and calculation of californium-252 fission neutron-induced gamma fields in iron (Cross sections, neutron and gamma spectra), 3:45718
Measurements of the average number of prompt neutrons emitted per fission of ^{239}Pu and ^{235}U (0.005 eV to 10 MeV), 3:45773 (ORNL/TM-6246)
Structure of neutron-rich even-even Cd Nuclei. I. Decay of ^{1}22Ag, 3:45739
URANIUM 236/FISSION
Dynamics of induced fission, 3:45765
URANIUM 238/CHARGE DISTRIBUTION
Nuclear charge distributions deduced from the muonic atoms of ^{2}32Th, ^{2}35U, ^{2}38U, and ^{2}39Pu, 3:45766
URANIUM 238/HEAVY ION REACTIONS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
URANIUM 238/LASER ISOTOPE SEPARATION
Apparatus for extraction and separation of a preferentially photo-dissociated molecular isotope into positive and negative ions by means of an electric field (Patent), 3:44258
URANIUM 238/SEPARATION NOZZLE METHOD
Physics of uranium-235-enrichment in the separation nozzle process. IV. Separation nozzle with double flow deflection and triple stream splitting, 3:44257
URANIUM 238 TARGET/ALPHA REACTIONS
Relativistic two-fluid model of nucleus-nucleus collisions, 3:45762
URANIUM 238 TARGET/ARGON 40 REACTIONS
Coulomb-nuclear interference for high-spin states excited by ^{8}6Kr, ^{4}0Ar, and ^{1}6O projectiles, 3:45748
URANIUM 238 TARGET/DEUTERON REACTIONS
Energy levels of ^{2}39U observed with the (d,p) reaction, 3:45769
URANIUM 238 TARGET/HEAVY ION REACTIONS
Dynamics of collision of fast nuclei (E ~ 200 MeV/nucleon), shock waves, and the compression of nuclear material (Nuclear density distribution, cascade models, fragmentation), 3:45808 (ORNL-tr-4653)
URANIUM 238 TARGET/KRYPTON 86 REACTIONS
Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
URANIUM 238 TARGET/NEON 20 REACTIONS
Relativistic two-fluid model of nucleus-nucleus collisions, 3:45762
URANIUM 238 TARGET/NEUTRON REACTIONS
Fission product yields from 6-9 MeV neutron-induced fission of ^{2}35U and ^{2}38U, 3:45777
Neutron capture cross-section ratios of ^{240}Pu, ^{242}Pu, ^{238}U, and ^{197}Au in the energy range from 10 to 90 keV, 3:45771
Precise measurement of the capture width of the 6.67-eV neutron resonance of uranium-238 (Cross sections), 3:45770
URANIUM 238 TARGET/PROTON REACTIONS
Energy spectra of nuclear fragments produced by high energy protons, 3:45707
URANIUM 239/ENERGY LEVELS
Energy levels of ^{2}39U observed with the (d,p) reaction, 3:45769
URANIUM COMPOUNDS/MOLECULAR MODELS
New structural model for humic material which shows sites for attachment of oxidized uranium species, 3:44240 (USGS-CIRC-753)
URANIUM DEPOSITS/AERIAL PROSPECTING
Geostatistics Project of the National Uranium Resource Evaluation Program. Progress report, January-March 1978, 3:44216 (LA-7296-PR)
How to plan an aerial gamma-ray survey, 3:44245 (USGS-CIRC-753)
URANIUM DEPOSITS/AGE ESTIMATION
Uranium-lead apparent ages of uraniferous secondary silica as a guide for describing uranium mobility, 3:44220 (USGS-CIRC-753)
URANIUM DEPOSITS/ELECTRICAL SURVEYS
Non-linear complex resistivity for the characterization of sedimentary uranium deposits, 3:44241 (USGS-CIRC-753)
URANIUM DEPOSITS/EXPLORATION
Assay for uranium and measurement of disequilibrium by means of high-resolution gamma-ray borehole sondes, 3:44227 (USGS-CIRC-753)
Determination of uranium in source rocks using radium in Crystal Springs, Great Salt Lake area, Utah, 3:44223 (USGS-CIRC-753)
Geologic foundation for uranium resource assessment, Triassic Chinle Formation, Southeast Utah, 3:44237 (USGS-CIRC-753)
Role of borehole electrical measurements in uranium exploration, 3:44244 (USGS-CIRC-753)

Two-mica granite and uranium potential in the northern Appalachian orogen of New England, 3:44246 (USGS-CIRC-753)
Uranium exploration using helium detection: a case study, 3:44225 (USGS-CIRC-753)
Uranium hydrogeochemical and stream sediment reconnaissance data release for the New Mexico portions of the Douglas, Silver City, Clifton, and Saint Johns NTMS quadrangles, New Mexico/Arizona, 3:44215 (LA-7180-MS)
Uranium potential of sedimentary and igneous rocks in western and southwestern Oklahoma, 3:44229 (USGS-CIRC-753)

URANIUM DEPOSITS/GEOCHEMICAL SURVEYS
Anomalous uranium in the waters of the Rio Ojo Caliente, New Mexico, 3:44236 (USGS-CIRC-753)
Geochemical interpretation of ore zonation at the Rifle vanadium mine, Colorado, 3:44226 (USGS-CIRC-753)
Hydrogeochemistry of uranium in the Walker River Basin, California and Nevada, 3:44233 (USGS-CIRC-753)
Multilaboratory analytical quality control for the hydrochemical and stream sediment reconnaissance (National Uranium Resource Evaluation (NURE)), 3:44213 (IS-4370)
New and recent results from the Canadian uranium reconnaissance program, 3:44230 (USGS-CIRC-753)
Procedures manual for groundwater reconnaissance sampling (NURE), 3:44214 (K/UR-12)
Refinement of the thermodynamic properties of uranium minerals and dissolved species, with application to the chemistry of ground waters in sandstone-type uranium deposits, 3:44228 (USGS-CIRC-753)

URANIUM DEPOSITS/GEOLOGICAL SURVEYS
Computer-enhanced images and geologic studies, southern Powder River Basin, Wyoming, 3:44247 (USGS-CIRC-753)
Geology of uraniferous tertiary rocks in the Artillery Peak-Date Creek basin, west-central Arizona, 3:44218 (USGS-CIRC-753)

URANIUM DEPOSITS/GEOPHYSICAL SURVEYS
Surface geophysical methods applied to uranium exploration in crystalline terranes, 3:44238 (USGS-CIRC-753)

URANIUM DEPOSITS/MAGNETIC SURVEYS
Total-field magnetic surveying as an exploration tool for sedimentary uranium deposits, 3:44242 (USGS-CIRC-753)

URANIUM DEPOSITS/MATHEMATICAL MODELS
Conceptual-mathematical models of uranium ore formation in sandstone-type deposits, 3:44251 (USGS-CIRC-753)

URANIUM DEPOSITS/MINERALIZATION
Thinning of the Fox Hills sandstone, Crook County, Wyoming: a possible guide to uranium mineralization, 3:44224 (USGS-CIRC-753)
Uranium deposits related to depositional environments in the Morrison Formation (upper jurassic), Henry Mountains mineral belt of southern Utah, 3:44222 (USGS-CIRC-753)

URANIUM DEPOSITS/ORIGIN
Theory for the origin of the Rifle-Garfield vanadium-uranium deposit, 3:44239 (USGS-CIRC-753)

URANIUM DEPOSITS/PROSPECTING
Geology of the Raleigh 1^{o} x 2^{o} Quadrangle, North Carolina, 3:44212 (GJBX-51(78))
Uranium prospecting in the Federal Republic of Germany, 3:44252

URANIUM DEPOSITS/SEDIMENTATION
Origin of uranium in the middle Precambrian Estes Conglomerate, Eastern Black Hills, South Dakota: inferences from lead isotopes, 3:44243 (USGS-CIRC-753)

URANIUM DEPOSITS/SPONTANEOUS FISSION
Oklo natural nuclear reactor, 3:45778

URANIUM DIOXIDE
Plutonium redistribution in mixed-oxide $(U,Pu)O_2$ nuclear fuel elements, 3:44772 (AERE-TP-714)

URANIUM DIOXIDE/CRITICALITY
Critical separation between subcritical clusters of 4.29 wt % ^{235}U enriched UO_2 rods in water with fixed neutron poisons, 3:45149 (NUREG/CR-0073)

URANIUM DIOXIDE/FABRICATION
Progress on sol-gel sphere-pac development, 3:44259 (CONF-780535-1)

URANIUM DIOXIDE/PHYSICAL RADIATION EFFECTS
HTGR fuels and core development program. Quarterly progress report for the period ending February 28, 1978, 3:44657 (GA-A-14863)

URANIUM HEXAFLUORIDE/ELECTRONIC STRUCTURE
Calculations of the electronic structure and transitions of actinide metal hexafluorides, 3:45507

URANIUM HYDRIDES/DESIGN
Apparatuses for the dissolution of resistent nuclear fuel for analytical sample preparation, 3:44265 (AIAU-77503)

URANIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)

URANIUM MINERALS
See also COFFINITE
URANINITES

URANIUM MINERALS/DEPOSITION
Conceptual-mathematical models of uranium ore formation in sandstone-type deposits, 3:44251 (USGS-CIRC-753)
Speculation on three possible modes of emplacement of uranium into deposits of the Midnite Mine, Stevens County, Washington, 3:44250 (USGS-CIRC-753)

URANIUM MINERALS/THERMODYNAMIC PROPERTIES
Refinement of the thermodynamic properties of uranium minerals and dissolved species, with application to the chemistry of ground waters in sandstone-type uranium deposits, 3:44228 (USGS-CIRC-753)

URANIUM MINES/BIBLIOGRAPHIES
Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964-1977, 3:44253 (NTIS/PS-78/0048)
Uranium mining and milling environmental studies (citations from the Engineering Index data base). Report for 1970-1977, 3:44254 (NTIS/PS-78/0049)

URANIUM MINES/GEOCHEMICAL SURVEYS
Geochemical prospecting at the Ladwig uranium mine, near Golden, Colorado, 3:44232 (USGS-CIRC-753)

URANIUM MINES/PROCESS CONTROL
Review of nuclear techniques for process control in the gold and uranium mining industries, 3:44255

URANIUM MINES/WASTE MANAGEMENT
Uranium mining and milling environmental studies (citations from the NTIS data base). Report for 1964-1977, 3:44253 (NTIS/PS-78/0048)
Uranium mining and milling environmental studies (citations from the Engineering Index data base). Report for 1970-1977, 3:44254 (NTIS/PS-78/0049)

URANIUM ORES/ACTIVATION ANALYSIS
Distribution of uranium in sediment samples as determined by multi-element analysis, 3:44221 (USGS-CIRC-753)

URANIUM ORES/ALPHA SPECTROSCOPY
Alpha spectrometry of thick sources. II. Application to the study of radioactive equilibria in uranium ores, 3:45128 (JEN-393)

URANIUM ORES/AUTORADIOGRAPHY
Examples of uranium distribution graphics in geologic rock specimens illustrated with the Radioluxograph, induced fission tracks, and other tracks methods, 3:44249 (USGS-CIRC-753)

URANIUM ORES/DELAYED NEUTRON ANALYSIS
^{252}Cf-based borehole logging system for in-situ assaying of uranium ore, 3:44235 (USGS-CIRC-753)
Uranium and thorium distribution in continental tertiary rocks of the Cook Inlet Basin and some adjacent areas, Alaska, 3:44234 (USGS-CIRC-753)

URANIUM ORES/ELECTRON MICROPROBE ANALYSIS
Uranium associated with iron-titanium oxide minerals and their alteration products in a south Texas roll-type deposit, 3:44219 (USGS-CIRC-753)

URANIUM ORES/GAMMA SPECTROSCOPY
Assay for uranium and measurement of disequilibrium by means of high-resolution gamma-ray borehole sondes, 3:44227 (USGS-CIRC-753)

URANIUM ORES/MEETINGS
Symposium 'geology, mining and extractive processing of uranium, with special reference to Europe', 3:44256

URANIUM ORES/MILLING
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346

URANIUM ORES/MINERALIZATION
Mechanism of layer-infiltration ore deposition, 3:44211

URANIUM ORES/MINING
Symposium 'geology, mining and extractive processing of uranium, with special reference to Europe', 3:44256
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346

URANIUM OXIDES
See also URANIUM DIOXIDE

URANIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074

URANIUM OXIDES/CHEMISORPTION
Application of a double-pass CMA to ion scattering from some actinide materials, 3:45012

URANIUM OXIDES/EMISSION SPECTROSCOPY
Single carrier method for the emission spectrometric analysis of uranium-plutonium oxides, 3:44262

URANIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074

UROGENITAL SYSTEM DISEASES/DIAGNOSIS
Toxicity of cadmium: mechanism and diagnosis, 3:45424

US DOE/COMPUTER GRAPHICS
Energy-related environmental computer graphics systems in the Department of Energy Laboratories, 3:46135 (CONF-7706110-)
USA
See also ALASKA
APPALACHIA
ARIZONA
CALIFORNIA
COLORADO
FLORIDA
GEORGIA
HAWAII
ILLINOIS
KANSAS
KENTUCKY
MASSACHUSETTS
MINNESOTA
MONTANA
NEVADA
NEW MEXICO
NEW YORK
NORTH CAROLINA
OKLAHOMA
SOUTH CAROLINA
SOUTH DAKOTA
TEXAS
UTAH
WASHINGTON
WYOMING
USA/AIR QUALITY
National air quality and emissions trends report, 1976, 3:45292 (EPA-450/1-77-002)
USA/COAL RESERVES
Summary of problems associated with coal reserve estimates (Definitions and validity of reserve and resources), 3:44092 (EMD-78-23)
USA/COASTAL WATERS
Benefits derived from the Outer Continental Shelf environmental studies program are questionable, 3:45328 (CED-78-93)
USA/FOOD
World food problem and U.S. food politics and policies: 1972-1976 (Book; 75 articles), 3:44865
USSR/EARTH CRUST
Crustal thickness in the island region of the Soviet Far East, 3:45428 (UCRL-Trans-11367)
USSR/EARTHQUAKES
Investigation of small earthquakes in Southwestern Turkmenia, 3:45430 (UCRL-Trans-11363)
Travel time curves of seismic waves for the southern Baikal region, 3:45429 (UCRL-Trans-11368)
USSR/NUCLEAR POWER
Fundamental studies of system investigations in nuclear energetics, 3:44721
UTAH/URANIUM DEPOSITS
Determination of uranium in source rocks using radium in Crystal Springs, Great Salt Lake area, Utah, 3:44223 (USGS-CIRC-753)
Geologic foundation for uranium resource assessment, Triassic Chinle Formation, Southeast Utah, 3:44237 (USGS-CIRC-753)
Uranium deposits related to depositional environments in the Morrison Formation (upper jurassic), Henry Mountains mineral belt of southern Utah, 3:44222 (USGS-CIRC-753)
Uranium-lead apparent ages of uraniferous secondary silica as a guide for describing uranium mobility, 3:44220 (USGS-CIRC-753)

V

V-A THEORY
(Weak interaction theory involving current-current vector-axial vector type of interaction.)
V-A THEORY/LEPTON-LEPTON INTERACTIONS
Possible existence of a weak V+A lepton-lepton interaction, 3:45623
VACUUM STATES/GAUGE INVARIANCE
Equivalence of worlds with different θ values in massless quantum chromodynamics, 3:45658
VACUUM SYSTEMS/LEAK TESTING
Nitrogen pressure in a vacuum system, 3:45227
VACUUM SYSTEMS/MOLECULE COLLISIONS
Rate at which molecules strike a surface or orifice in a vacuum system, 3:45865
VALVES
Valve maintainability in CANDU-PHW nuclear generating stations, 3:44676 (AECL-5913)
VALVES/DESIGN
Coal gasification valves: Phase II. Quarterly technical progress report, September 1977-November 1977 (High temperature), 3:44042 (FE-2355-2(Rev.E))
VALVES/MATERIALS TESTING
Coal gasification valves: Phase II. Quarterly technical progress report, September 1977-November 1977 (High temperature), 3:44042 (FE-2355-2(Rev.E))
VANADIUM/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
VANADIUM/CRYSTAL-PHASE TRANSFORMATIONS
Physical properties of vanadium in the temperature range 4.2-300 ^{0}K, 3:45042
VANADIUM/ELECTRIC CONDUCTIVITY
Physical properties of vanadium in the temperature range 4.2-300 ^{0}K, 3:45042
VANADIUM/ELECTRONIC STRUCTURE
Characteristics of electron spectrum and coupling constants in vanadium, 3:45043
VANADIUM/FERMI LEVEL
Characteristics of electron spectrum and coupling constants in vanadium, 3:45043
VANADIUM/HALL EFFECT
Physical properties of vanadium in the temperature range 4.2-300 ^{0}K, 3:45042
VANADIUM/MAGNETIC SUSCEPTIBILITY
Physical properties of vanadium in the temperature range 4.2-300 ^{0}K, 3:45042
VANADIUM/SPECIFIC HEAT
Physical properties of vanadium in the temperature range 4.2-300 ^{0}K, 3:45042
VANADIUM 46/ENERGY LEVELS
Nuclear data sheets for A=46, 3:45723
VANADIUM 46/ENERGY-LEVEL TRANSITIONS
Nuclear data sheets for A=46, 3:45723
VANADIUM ALLOYS/FORGING
Investigation of separation-lubrication substances for use in isothermal forging. Final report, 16 December 1974-1 July 1976 (Ti-6Al-4V, 1300F to 1800F), 3:45002 (AD-A-048588)
VANADIUM ALLOYS/FRACTURE PROPERTIES
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
VANADIUM ALLOYS/HOT PRESSING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
VANADIUM ALLOYS/WELDING
Flight qualification of titanium F-14A airframe components manufactured by hot isostatic pressing (HIP). Final report, 1 November 1975-31 March 1977 (Ti-6Al-6V-2Sn), 3:45001 (AD-A-048485)
VANADIUM IONS/ULTRAVIOLET SPECTRA
$3d^2$-3d4f transitions in V IV, 3:45499
VANADIUM ORES/GEOCHEMICAL SURVEYS
Geochemical interpretation of ore zonation at the Rifle vanadium mine, Colorado, 3:44226 (USGS-CIRC-753)
VAPOR INCINERATORS
See AFTERBURNERS
VAPORS/DIFFUSION
Mass transport characteristics of zeolite cracking catalysts. Quarterly report, September 30-December 31, 1977, 3:44068 (FE-2727-1)
VARIABLE MOMENT OF INERTIA MODEL
See VMI MODEL
VARIABLE STARS/STAR MODELS
Theoretical models of 10 day Cepheids, 3:45440
VECTOR DOMINANCE MODEL/DEEP INELASTIC SCATTERING
Deep inelastic processes as a means of investigating the structure of nucleons, nuclei, and the nature of nuclear forces, 3:45624
VECTOR MESONS
(Mesons with spin-one.)
See also PSI RESONANCES
RHO-765 RESONANCES
VECTOR MESONS/DECAY
Decays of the Y' and the structure of the resonances at 10 GeV, 3:45595
VECTOR MESONS/PARTICLE PRODUCTION
Diffractive production of vector mesons in high-energy neutrino interactions, 3:45567

VEGETATION
See PLANTS
VEHICLES
See also AUTOMOBILES
BUSES
VEHICLES/DESIGN
Advisory Council on Energy Conservation. Paper 5. Road vehicle and engine design: short- and medium-term energy considerations (Monograph), 3:44873
VEHICLES/ENERGY CONSERVATION
Advisory Council on Energy Conservation. Paper 5. Road vehicle and engine design: short- and medium-term energy considerations (Monograph), 3:44873
VENTILATION SYSTEMS/ENERGY CONSERVATION
Design of a mobile laboratory for ventilation studies and indoor air pollution monitoring, 3:44938 (LBL-7817)
Economy of ventilators in plants with variable volume flow, 3:44949
VESSELS
See CONTAINERS
VESSELS (PRESSURE)
See PRESSURE VESSELS
VINCA R-A REACTOR YUGOSLAVIA
See R-A REACTOR
VINOFLEX
See POLYVINYLS
VINYLBENZENE
See STYRENE
VINYLCYANIDE
See ACRYLONITRILE
VMI MODEL/QUADRUPOLE MOMENTS
Electric and dynamic quadrupole moments of even-even nuclei, 3:45781
VOLCANIC REGIONS/GEOTHERMAL EXPLORATION
Guanacaste Geothermal Project. Technical prefeasibility report. Annex A. Geology, 3:44577 (NP-23014)
VOLCANIC REGIONS/GEOTHERMAL GRADIENTS
Guanacaste Geothermal Project. Technical prefeasibility report. Annex F. Heat flow (Las Hornillas, Las Pailas, and Boriaguen), 3:44582 (NP-23015)
VOLCANOES
Active volcanoes and their relation to geothermal energy, 3:44569 (NP-22160)
VOLCANOES/GEOCHEMICAL SURVEYS
Hot spring and volcanic gas of Ogasawara Ioo Island, 3:44588 (NP-22298)
VOLTAIC CELLS
See ELECTRIC BATTERIES

W

WAK
(Wiederaufarbeitungsanlage Karlsruhe.)
WAK/OFF-GAS SYSTEMS
Measurement of the distribution of ^{129}I in and its discharge from the Karlsruhe Reprocessing Plant, 3:44303 (BNWL-tr-311)
WAK/RADIOACTIVE EFFLUENTS
Measurement of the distribution of ^{129}I in and its discharge from the Karlsruhe Reprocessing Plant, 3:44303 (BNWL-tr-311)
WANKEL ENGINES/EXHAUST RECIRCULATION SYSTEMS
Rotary piston engine exhaust gas recycling means (Patent), 3:44980
WASHINGTON/URANIUM DEPOSITS
Speculation on three possible modes of emplacement of uranium into deposits of the Midnite Mine, Stevens County, Washington, 3:44250 (USGS-CIRC-753)
WASTE HEAT/HEAT RECOVERY
Illumination also needs energy. Measures for rational and economical uses of illumination energy, 3:44950
WASTE HEAT UTILIZATION
Energy utilization in steel production - present status and future possibilities, 3:44961
Suggestion for the definition and term limitation in the environment and waste heat utilisation, 3:44917
Utilization of waste heat from electricity generating stations, 3:44869 (AECL-5689)
Waste energy utilization in a rolling mill and in the subsequent treatment, 3:44960
Water and heat recycling, 3:44929
WASTE MANAGEMENT
See also RADIOACTIVE WASTE MANAGEMENT
WASTE PROCESSING
WASTE MANAGEMENT/BIBLIOGRAPHIES
Coal mine waste (a bibliography with abstracts). Report for 1964-January 1978, 3:44086 (NTIS/PS-78/0052)
WASTE MANAGEMENT/COST
Assessment of industrial hazardous waste practices in the metal smelting and refining industry. Volume IV. Appendices. Final report, May 1974-April 1977, 3:45365 (PB-276172)
WASTE PROCESSING
See also RADIOACTIVE WASTE PROCESSING
WASTE PROCESSING/SOLAR HEATING
Method and equipment for producing synthetic fuel from wastes (Patent), 3:44336
WASTE PROCESSING PLANTS/MAINTENANCE
Remote maintenance development, July 1, 1976-June 30, 1977 (For New Waste Calcination Facility), 3:45148 (ICP-1143)
WASTE SOLUTIONS
See LIQUID WASTES
WASTE WATER/WASTE PROCESSING
Review of current interest and research in water hyacinth-based wastewater treatment. Final report, 3:44966 (N-77-33683)
WASTE WATER/WATER TREATMENT
Preliminary evaluation of the biological oxidation of thiocyanates. Progress report, November 30, 1977-February 28, 1978, 3:44085 (COO-4502-2)
WATER
See also DRINKING WATER
GROUND WATER
SEAWATER
SURFACE WATERS
WATER/CHEMICAL ANALYSIS
Mercury distribution in the Chesapeake Bay, 3:45350
WATER/CORROSIVE EFFECTS
Materials research for clean utilization of coal. Quarterly progress report, July-September 1977, 3:44049 (FE-3800-13)
WATER/GAMMA SPECTRA
Secondary gamma radiation study in reactor shielding, 3:44769
WATER/PHASE STUDIES
Fossil energy program. Quarterly progress report for the period ending December 31, 1977, 3:44021 (ORNL-5387)
WATER/POLLUTION
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
Transport and biological effects of molybdenum in the environment (V, Cu), 3:45346
WATER/PURIFICATION
Removal of gas chromatographable organic compounds from water by a spray vaporization technique, 3:45116
WATER/RADIATION MONITORING
Annual environmental monitoring report: calender year 1977 (^{238}Pu, ^{3}H, Mound Laboratory), 3:45316 (MLM-2515)
WATER/RECYCLING
Water and heat recycling, 3:44929
WATER/SENSIBLE HEAT STORAGE
Some experimental data for thermal pile energy storage, 3:44560 (CONF-761220-)
WATER COOLED GRAPHITE MODERATED REACTORS
See LWGR TYPE REACTORS
WATER COOLED REACTORS
See also BWR TYPE REACTORS
HFR REACTOR
LWGR TYPE REACTORS
PWR TYPE REACTORS
SGHWR REACTOR
WATER COOLED REACTORS/LOSS OF COOLANT
Study of Zircaloy-4: steam oxidation reaction kinetics. Final report, 3:44801 (EPRI-NP-734(Pt.2))
WATER COOLED REACTORS/REACTOR ACCIDENTS
Two-phase flow measurement by radioactive tracer techniques, 3:44798 (CONF-771126-8)
WATER COOLED REACTORS/REACTOR COMPONENTS
Effective mass and damping of submerged structures, 3:44817 (UCRL-52342)
WATER POLLUTION
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
Methylmercury analysis (a review and some data) (Minamata disease in Japan), 3:45341
Physical-chemical methods of heavy metals removal (Water pollution), 3:45351
Sorption phenomenon in the organics of bottom sediments (Mercury, sulfur), 3:45344
Supplement to effects of thermal discharges on physico-chemical processes and water quality, Vistula River, Poland. Final report, January 1973-December 1975, 3:45361 (PB-273580)
Use of synthetic scavengers for the binding of heavy metals (Mercury), 3:45355

WATER POLLUTION/BIBLIOGRAPHIES
Water pollution analysis and detection. Volume 2. July 1974-December 1976 (a bibliography with abstracts). Report for July 1974-December 1976, 3:45330 (NTIS/PS-78/0039)
WATER POLLUTION/BIOLOGICAL EFFECTS
Chemical effluents in surface waters from nuclear power plants: research order Nos. 60-78-040 and 60-78-042. Quarterly progress report, 3:44776 (UCID-17744-78-2)
WATER POLLUTION/CHEMICAL ANALYSIS
Water pollution analysis and detection. Volume 2. July 1974-December 1976 (a bibliography with abstracts). Report for July 1974-December 1976, 3:45330 (NTIS/PS-78/0039)
Water pollution analysis and detection. Volume 3. 1977-January 1978 (a bibliography with abstracts). Report for 1977-January 1978, 3:45331 (NTIS/PS-78/0040)
WATER POLLUTION/DATA ANALYSIS
Water resources research program. Pollution of coastal waters off Chicago by sinking plumes from the Indiana Harbor Canal, 3:45327 (ANL/WR-77-2)
WATER POLLUTION/ENVIRONMENTAL EFFECTS
Perspectives on the environment, 3:45294 (NP-23191)
Project development and technical development plan. New York Bight Project, 3:45358 (PB-276014)
WATER POLLUTION/LEGAL ASPECTS
Current regulations and enforcement experience by the environmental protection agency, 3:45356
WATER POLLUTION/MEETINGS
Heavy metals in the aquatic environment, 3:45338
WATER POLLUTION/MONITORING
CEQ studies, 3:45296 (NP-23191)
Current regulations and enforcement experience by the environmental protection agency, 3:45356
Environmental quality. The sixth annual report of the Council on Environmental Quality, 3:45293 (NP-23191)
Environmental surveillance at Los Alamos during 1977, 3:45315 (LA-7263-MS)
Water pollution analysis and detection. Volume 3. 1977-January 1978 (a bibliography with abstracts). Report for 1977-January 1978, 3:45331 (NTIS/PS-78/0040)
WATER POLLUTION/OXIDATION
Oxidation of ecologically relevant substances in effluents and water, 3:45336
WATER POLLUTION/POLLUTION CONTROL
Canadian experience with the reduction of mercury at chlor-alkali plants, 3:45313
Current regulations and enforcement experience by the environmental protection agency, 3:45356
WATER POLLUTION/REGULATIONS
Current regulations and enforcement experience by the environmental protection agency, 3:45356
WATER POLLUTION/SIMULATION
Feasibility of restoring mercury-contaminated waters, 3:45353
WATER POLLUTION/WASTE PROCESSING
Current regulations and enforcement experience by the environmental protection agency, 3:45356
WATER POLLUTION CONTROL
Control of volatile organic emissions from solvent metal cleaning, 3:45322 (PB-274557)
WATER POLLUTION CONTROL/GOVERNMENT POLICIES
Environmental quality control - governmental finances: fiscal year 1974-1975. State and local government special studies, 3:45299 (PB-275760)
WATER POLLUTION CONTROL/MANAGEMENT
Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report, 3:44860 (PB-274411)
WATER QUALITY
CEQ studies, 3:45296 (NP-23191)
Environmental conditions and trends, 3:45295 (NP-23191)
WATER QUALITY/POLLUTION REGULATIONS
Conservation districts and 208 water quality management: non-point source identification and assessment, selection of best management practices, management agencies, regulatory programs. Final report, 3:44860 (PB-274411)
WATER REQUIREMENTS/FORECASTING
Directions in U.S. water research: 1978-1982. Final draft report, 3:44862 (PB-274278)
WATER RESERVOIRS/POLLUTION
Experience with heavy metals in the Tennessee Valley Authority system, 3:45354
WATER RESOURCES/DATA ANALYSIS
Analyses of methods for the determination of water availability for energy development, 3:44854 (PB-274080)
WATER RESOURCES/MANAGEMENT
Massachusetts coastal zone management program. Volume I, 3:45325 (PB-274031)
WATER RESOURCES/RESEARCH PROGRAMS
Directions in U.S. water research: 1978-1982. Final draft report, 3:44862 (PB-274278)
WATERFLOODING/DEMONSTRATION PROGRAMS
Improved secondary oil recovery by controlled water flooding-pilot demonstration, Ranger Zone, Fault Block VII, Wilmington Field: Phase I. Quarterly report, October-December 1977, 3:44152 (SAN-1396-15)
Western gas sands project. Status report, 3:44196 (NVO-0655-105)
WAVES (SHOCK)
See SHOCK WAVES
WEAK INTERACTIONS/GAUGE INVARIANCE
SU(3) x U(1) gauge theory of weak and electromagnetic interactions, 3:45601
WEAK NEUTRAL CURRENTS/COUPLING CONSTANTS
Determination of the weak neutral-current couplings, 3:45616
WEATHER/DATA ANALYSIS
Estimating the energy conservation potential of ventilation control through weather data analysis. Final report, 3:44946 (PB-273949)
WEATHERING/MECHANICAL EFFECTS
Mechanical dispersal of oil stranded in the littoral zone, 3:45334
WEINBERG-SALAM GAUGE MODEL/LAGRANGIAN FUNCTION
Spontaneous symmetry breaking and nonlinear invariant Lagrangians: Applications to SU(2) x U(1) and OSp(1/4), 3:45646
WEINBERG-SALAM GAUGE MODEL/NEUTRAL-CURRENT INTERACTIONS
Neutral-current coupling in high-energy neutrino interactions, 3:45569
Neutral-current constraints on SU(2) x U(1) gauge theories, 3:45648
WEINBERG-SALAM GAUGE MODEL/SYMMETRY BREAKING
Spontaneous symmetry breaking and nonlinear invariant Lagrangians: Applications to SU(2) x U(1) and OSp(1/4), 3:45646
WEIZSAECKER FORMULA/CORRECTIONS
Presence of π^- mesons in heavy atomic nuclei, 3:45761
WELL DRILLING
See also DRILLS
WELL DRILLING/ECONOMIC ANALYSIS
Geothermal well technology: drilling and completions program plan, 3:44596 (SAND-77-1630)
WELL DRILLING/TECHNOLOGY ASSESSMENT
Geothermal well technology: drilling and completions program plan, 3:44596 (SAND-77-1630)
WELL LOGGING
See also INDUCTION LOGGING
WELL LOGGING/EQUIPMENT
Method and apparatus for investigating earth formations utilizing microwave electromagnetic energy (Patent), 3:45279
Method and apparatus for running and retrieving logging instruments in highly deviated well bores (Patent), 3:45277
WEST VALLEY PROCESSING PLANT/RADIOACTIVE WASTE STORAGE
Evaluation of the integrity of existing NFS waste tanks, 3:44295 (UCRL-13839)
WEST VALLEY PROCESSING PLANT/TANKS
Environmental effects on metal structures and connection in NFS waste tanks, 3:44294 (UCRL-13837)
WHISKERS/ELECTRIC CONDUCTIVITY
Voltage jumps in the current-voltage characteristics of superconductive channels, 3:45048
WHITESHELL-1 REACTOR
See WR-1 REACTOR
WILD ANIMALS/POLLUTION
Distribution of mercury in fish and its form of occurrence, 3:45348
WIND/SHEAR
Wind shear fluctuations downwind of large surface roughness elements, 3:44605
WIND POWER PLANTS/CONTROL SYSTEMS
Design and stability of master control systems for energy independent homes, 3:44435 (CONF-761220-)
WIND POWER PLANTS/POWER GENERATION
Reliability of wind power from dispersed sites: a preliminary assessment, 3:44602 (LBL-6889)
WIND POWER PLANTS/RELIABILITY
Reliability of wind power from dispersed sites: a preliminary assessment, 3:44602 (LBL-6889)
WIND TURBINES
Windmill with radial vanes (Patent), 3:44604
WIND TURBINES/FEASIBILITY STUDIES
Wind-solar coupled domestic heating system, 3:44419 (CONF-761220-)

WINDOWS/COATINGS
Discussion of heat mirror film: performance, production process, and cost estimates, 3:44925 (LBL-7812)
WINDOWS/HEAT LOSSES
Influence of tightening of the windows on the condensation and the heat economy, 3:44927 (UCRL-Trans-1548)
Discussion of heat mirror film: performance, production process, and cost estimates, 3:44925 (LBL-7812)
Possibilities of improving the heat insulation of the windows, 3:44936 (UCRL-Trans-1549)
WINDOWS/SOLAR ABSORBERS
Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling, 3:44475 (CONF-761220-)
WINDOWS/SOLAR COLLECTORS
Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling, 3:44475 (CONF-761220-)
WINDOWS/SOLAR REFLECTORS
Sunergy louver drape: a unique passive solar heat collector and reflector for space heating and cooling, 3:44475 (CONF-761220-)
WINSTON COLLECTORS
See COMPOUND PARABOLIC CONCENTRATORS
WIRES/IGNITION
Source of ignition 'hot surfaces', 3:45131
WOOD/FLUIDIZED-BED COMBUSTION
Energy extraction from vegetative fuels: wood gasification, 3:44340
WORKERS
See PERSONNEL
WORKING FLUIDS/SOLUBILITY
Alternate working fluids for solar air conditioning applications, 3:44439 (CONF-761220-)
WORMS (SEGMENTED)
See ANNELIDS
WR-1 REACTOR/FUEL ELEMENTS
Performance of highly rated UO_2 fuel in the WR-1 organic-cooled reactor, 3:44777 (AECL-5399)
WYOMING/URANIUM DEPOSITS
Computer-enhanced images and geologic studies, southern Powder River Basin, Wyoming, 3:44247 (USGS-CIRC-753)
Thinning of the Fox Hills sandstone, Crook County, Wyoming: a possible guide to uranium mineralization, 3:44224 (USGS-CIRC-753)
Total-field magnetic surveying as an exploration tool for sedimentary uranium deposits, 3:44242 (USGS-CIRC-753)
Uranium-lead apparent ages of uraniferous secondary silica as a guide for describing uranium mobility, 3:44220 (USGS-CIRC-753)

X

2X DEVICES/REVIEWS
U. S. Mirror Fusion Program, 3:45895
X RADIATION/BIOLOGICAL RADIATION EFFECTS
Preclinical experiments for analysis of tumor regression due to negative pions, 3:45401 (LA-tr-77-73B)
XENON/ATOM-ATOM COLLISIONS
Calculated long-range interactions and low energy scattering in He+H, Ne+H, Ar+H, Kr+H, and Xe+H, 3:45525
XENON/ATOM-MOLECULE COLLISIONS
Collision-induced ion-pair formation of CsCl and Cs_2Cl_2 , 3:45526
XENON/PHOTOIONIZATION
Relativistic effects on low-energy 5s → εp photoionization for xenon, 3:45497
XENON 136 REACTIONS/DEEP INELASTIC SCATTERING
Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
XENON 136 REACTIONS/QUASI-FISSION
Recoil range distributions of heavy mass products in deep inelastic reactions with gold and uranium targets, 3:45759
XENON FLUORIDES/ELECTRONIC STRUCTURE
Covalent and ionic states of the rare gas monofluorides, 3:45174
XENON FLUORIDES/EMISSION SPECTRA
Spectroscopic studies of diatomic noble gas halides. III. Analysis of XeF 3500 A band system, 3:45175
Spectroscopic studies of diatomic noble gas halides. IV. Vibrational and rotational constants for the X, B, and D states of XeF, 3:45176
XENON FLUORIDES/EXCITED STATES
Energy ordering of the excited states of XeF, 3:45173
XI MINUS/LEPTONIC DECAY
Measurement of $\Sigma^- \rightarrow \Lambda e^- \bar{\nu}$ and $\Xi^- \rightarrow \Lambda e^- \nu$ branching ratios, 3:45568
X-RAY EQUIPMENT
See also BEAM OPTICS
X-RAY SOURCES
X-RAY EQUIPMENT/PLASMA DIAGNOSTICS
Imaging characteristics of an axisymmetric, grazing incidence x-ray microscope designed for laser fusion research, 3:45253
X-RAY FLUORESCENCE ANALYSIS
Review of the status of total mercury analysis, 3:45107
X-RAY GALAXIES/X-RAY SPECTRA
X-ray emitting galaxy Can-A, 3:45451 (N-77-34092)
X-RAY LASERS/FEASIBILITY STUDIES
Progress on x-ray laser research, 3:45216
X-RAY RADIOGRAPHY/IONIZATION CHAMBERS
Electroradiographic device (Patent), 3:45257
X-RAY RADIOGRAPHY (BIOMEDICAL)
See BIOMEDICAL RADIOGRAPHY
X-RAY SOURCES/DESIGN
Method and apparatus involving the generation of x-rays (Patent), 3:44323
X-RAY TRANSMISSION SCANNING
See PHOTON TRANSMISSION SCANNING

Y

YANG-MILLS THEORY/ANALYTICAL SOLUTION
Screening solutions to classical yang-mills theory, 3:45660
YANG-MILLS THEORY/INSTANTONS
Interpretation of small variations of an n-pseudoparticle solution, 3:45671
YANG-MILLS THEORY/MINKOWSKI SPACE
Screening solutions to classical yang-mills theory, 3:45660
YANKEE MAINE REACTOR
See MAINE YANKEE REACTOR
YEASTS/BIOLOGICAL RADIATION EFFECTS
Radiobiological research and radiotherapy. Proceedings series. Proceedings of an international symposium on the radiobiological research needed for the improvement of radiotherapy (LET, heavy nuclei, neutrons, ^{252}Cf, ^{241}Am, fast electrons, x radiation), 3:45399 (STI/PUB-441(Vol.2))
YIELD (NUCLEAR REACTION)
See NUCLEAR REACTION YIELD
YTTERBIUM/ABSORPTION SPECTRA
Absorption spectrum of ytterbium vapor in the 1700-1060 A region, 3:45512
YTTERBIUM/ULTRAVIOLET SPECTRA
Absorption spectrum of ytterbium vapor in the 1700-1060 A region, 3:45512
YTTERBIUM OXIDES/CHARGED-PARTICLE TRANSPORT
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
YTTERBIUM OXIDES/POLARIZABILITY
Electron energy losses and ion polarizability in certain transition-metal oxides, 3:45074
YTTRIUM ALLOYS/SPECIFIC HEAT
Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys, 3:45028
YTTRIUM ALLOYS/SUPERCONDUCTIVITY
Calorimetric study of the magnetization of Ce impurities in superconducting Th-Y and Th-Sc alloys, 3:45028
YTTRIUM FLUORIDES/MAGNETO-OPTICAL EFFECTS
Magneto-optical properties of KTb_3F_10 and $LiTbF_4$ crystals, 3:45090
YTTRIUM ISOTOPES/LEACHING
Sorption-desorption studies of Nevada Test Site alluvium and leaching studies of nuclear test debris, 3:45323 (LA-7216-MS)
YUGOSLAVIA R-A REACTOR VINCA
See R-A REACTOR

Z

ZEA MAYS
See MAIZE
ZEOLITES/CATALYTIC EFFECTS
Microspheres containing Nay zeolite synthesized from a South African kaolinite. (Precursor for a fluidized bed cracking catalyst), 3:44158 (PB-274450)

ZEOLITES/POROSITY
Mass transport characteristics of zeolite cracking catalysts. Quarterly report, September 30-December 31, 1977, 3:44068 (FE-2727-1)
ZEOLITES/SORPTIVE PROPERTIES
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
ZINC/ADSORPTION
Fundamental experimental studies of the treatment of geothermal effluent using SHIRASU zeolite: absorption removal of heavy metals, 3:44592 (NP-22840)
ZINC/BIOLOGICAL EFFECTS
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
ZINC/CHEMICAL ANALYSIS
Geochemical studies on the thermal brine from Reykjanes (Iceland), 3:44590
ZINC/ECOLOGICAL CONCENTRATION
Effects and removal of heavy metals in biological treatment (Water pollution), 3:45352
Investigations of heavy metals and other persistent chemicals, Westernport Bay, Australia (Zn, Cu, and Cd in oysters), 3:45349
ZINC/MAXIMUM PERMISSIBLE CONCENTRATION
Effects of heavy metals on fish and aquatic organisms (Pb, Hg, As, Se, Zn), 3:45339
ZINC/X-RAY FLUORESCENCE ANALYSIS
Salton Sea sampling program: baseline and toxicity studies, 3:44594 (UCRL-13849)
ZINC 64/GIANT RESONANCE
Electroexcitation of giant multiple resonances in ^{6}4Zn and ^{1}24Sn nuclei, 3:45735
ZINC 64 TARGET/ALPHA REACTIONS
Mass and low-lying levels of ^{6}7Ge; trends in the structure of /sup 63,65/Ni, /sup 65,67/Zn, and /sup 67,69/Ge, 3:45732
ZINC 64 TARGET/ELECTRON REACTIONS
Electroexcitation of giant multiple resonances in ^{6}4Zn and ^{1}24Sn nuclei, 3:45735
ZINC 67/ENERGY LEVELS
Multiparticle configurations in the odd-neutron nuclei ^{6}1Ni and ^{6}7Zn populated by decay of ^{6}1Cu, ^{6}7Cu, and ^{6}7Ga, 3:45730
ZINC BASE ALLOYS/USES
Zinc, its properties and its applicability for solar technology, 3:44554
ZIRCALOY 4/OXIDATION
Study of Zircaloy-4: steam oxidation reaction kinetics. Final report, 3:44801 (EPRI-NP-734(Pt.2))
ZIRCONIUM/CHEMICAL REACTIONS
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
ZIRCONIUM/ENVIRONMENTAL TRANSPORT
Mobility of organic complexes of some non-TRU fission and activation products: a selective review, 3:44302 (PNL-2607)
ZIRCONIUM 90/CHARGE DENSITY
Pion-exchange contributions to charge densities of closed-shell nuclei, 3:45691
ZIRCONIUM 90 TARGET/PROTON REACTIONS
Analyzing power in proton-nucleus elastic scattering at 0.8 GeV, 3:45702
ZIRCONIUM ALLOYS
See also ALLOY-TZM
ZIRCONIUM BASE ALLOYS
ZIRCONIUM ALLOYS/AGE HARDENING
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
ZIRCONIUM ALLOYS/CRYSTAL STRUCTURE
Diffuse neutron scattering in Nb-Zr alloys, 3:45026
ZIRCONIUM ALLOYS/MICROSTRUCTURE
Some observations on the structure of Ti-11.5Mo-6Zr-4.5Sn (beta III) as affected by processing history. Technical report, 3:45007 (AD-A-048772)
The relationship between the microstructure and age hardening response in the metastable beta titanium alloy Ti-11.5Mo-6Zr-4.5Sn (beta III). Technical report, 3:45008 (AD-A-048773)
ZIRCONIUM ALLOYS/NEUTRON DIFFRACTION
Diffuse neutron scattering in Nb-Zr alloys, 3:45026
ZIRCONIUM BASE ALLOYS/GRAIN ORIENTATION
Measurement of crystallographic texture at Chalk River Nuclear Laboratories, 3:45009 (AECL-5626)
ZIRCONIUM BASE ALLOYS/TEXTURE
Measurement of crystallographic texture at Chalk River Nuclear Laboratories, 3:45009 (AECL-5626)
ZIRCONIUM HYDRIDES/CRYSTAL-PHASE TRANSFORMATIONS
Low-temperature NMR investigation of zirconium hydride, 3:45064
ZIRCONIUM HYDRIDES/DISSOLUTION
Apparatuses for the dissolution of resistent nuclear fuel for analytical sample preparation, 3:44265 (AIAU-77503)
ZIRCONIUM HYDRIDES/SPIN-LATTICE RELAXATION
Low-temperature NMR investigation of zirconium hydride, 3:45064
ZIRCONIUM HYDRIDES/SPIN-SPIN RELAXATION
Low-temperature NMR investigation of zirconium hydride, 3:45064
ZIRCONIUM OXIDES/FILM CONDENSATION
Dependence of the index of refraction and microporosity of zirconium dioxide films on the deposition conditions, 3:45062
ZIRCONIUM OXIDES/POROSITY
Dependence of the index of refraction and microporosity of zirconium dioxide films on the deposition conditions, 3:45062
ZIRCONIUM OXIDES/REFRACTIVITY
Dependence of the index of refraction and microporosity of zirconium dioxide films on the deposition conditions, 3:45062
ZOOPLANKTON
See also CRUSTACEANS
ZOOPLANKTON/METABOLISM
Regeneration of nutrients by zooplankton and fish off northwest Africa, 3:45374 (BNL-24177)
ZPR-6 REACTOR/REACTOR LATTICE PARAMETERS
Comparative safety physics parameters in the advanced fuels critical assemblies, 3:44786 (ZPR-TM-312)

CONTRACT NUMBER INDEX

Numbers assigned to DOE contracts under which reports announced in this publication were prepared are included in this index.

Contract No.	*Abstract No.*	*Report No.*
EA-77-A-01-6010-002	**National Bureau of Standards, Washington, D.C. (USA). Inst. for Materials Research**	
	3:44049	FE—3800-13
EC-77-C-01-5089	**Aluminum Co. of America, Alcoa Center, Pa. Alcoa Labs.**	
	3:45003	TID—28260
EC-77-S-02-4531	**Illinois Inst. of Tech., Chicago (USA)**	
	3:44611	COO—4531-1
EF-76-C-01-2306	**Suntech, Inc., Marcus Hook, Pa. (USA). Research and Engineering Div.**	
	3:44064	FE—2306-12
	3:44069	TID—28163
EF-76-C-05-5301	**Pennzoil Co., Vienna, W.Va. (USA)**	
	3:44151	ORO—5301-7
EF-77-A-01-2616	**Jet Propulsion Lab., Pasadena, Calif. (USA)**	
	3:44053	TID—27900
EF-77-A-04-3873	**Occidental Oil Shale, Inc., Grand Junction, Colo. (USA)**	
	3:44205	TID—28053/2
EF-77-A-043873	**Occidental Oil Shale, Inc., Grand Junction, Colo. (USA)**	
	3:44204	TID—28053/1
EF-77-C-01-2579	**Combustion Power Co., Inc., Menlo Park, Calif. (USA)**	
	3:44028	FE—2579-13
EF-77-C-01-2583	**Stone and Webster Engineering Corp., Boston, Mass. (USA)**	
	3:44608	FE—2583-13
EF-77-C-01-2621	**International Nickel Co., Inc., Suffern, N.Y. (USA)**	
	3:45004	TID—28288
EF-77-C-03-1396	**Long Beach, City of, Calif. (USA)**	
	3:44152	SAN—1396-15
EF-77-S-01-2666	**Brigham Young Univ., Provo, Utah (USA). Dept. of Chemical Engineering**	
	3:44047	FE—2666-2
EF-77-S-01-2727	**Mississippi Univ., University (USA). Dept. of Chemical Engineering**	
	3:44068	FE—2727-1
EF-77-S-01-2729	**Brigham Young Univ., Provo, Utah (USA)**	
	3:44048	FE—2729-1
EF-77-S-02-4227	**Chicago Univ., Ill. (USA)**	
	3:44074	COO—4227-4
EG-77-C-01-4049	**International Business Machines Corp., Huntsville, Ala. (USA)**	
	3:44441	SOLAR/0004—78/18
EG-77-C-02-4181	**ECON, Inc., Princeton, N.J. (USA)**	
	3:46081	COO—4181-1
EG-77-C-03-1326	**Geonomics, Inc., Berkeley, Calif. (USA)**	
	3:44600	SAN—1326-1/1
EG-77-S-02-4385	**Notre Dame Univ., Ind. (USA)**	
	3:45831	COO—4385-1
EG-77-S-04-3977	**New Mexico Univ., Albuquerque (USA). Dept. of Physics and Astronomy**	
	3:44498	TID—28168
EM-76-C-01-8625	**Battelle Columbus Labs., Ohio (USA)**	
	3:44955	FEA/D—77/243
EM-76-C-01-8648	**Science Applications, Inc., La Jolla, Calif. (USA)**	
	3:44926	SAI—77-858-LJ
EM-78-C-02-4507	**Avco Corp., Wilmington, Mass. (USA). Systems Div.**	
	3:44073	TID—28423
EN-77-S-02-4261	**Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering**	
	3:44800	COO—4261-4
ES-77-S-02-4251	**Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.**	
	3:45165	COO—4251-6
EX-76-C-01-1237	**Pope, Evans and Robbins, Inc., New York (USA)**	
	3:44614	FE—1237-T-7
EX-76-C-01-1527	**Bituminous Coal Research, Inc., Monroeville, Pa. (USA)**	
	3:44035	FE—1527-43(Vol.2)
	3:44036	FE—1527-43(Vol.3)
EX-76-C-01-1545	**Combustion Engineering, Inc., Windsor, Conn. (USA)**	
	3:44037	FE—1545-44
EX-76-C-01-1765	**General Electric Co., Schenectady, N.Y. (USA). Gas Turbine Div.**	
	3:44615	FE—1765-42
EX-76-C-01-1787	**Illinois Univ., Chicago (USA). Dept. of Energy Engineering**	
	3:45231	FE—1787-8
EX-76-C-01-1794	**Ingersoll-Rand Research, Inc., Princeton, N.J. (USA)**	
	3:44038	FE—1794-25
EX-76-C-01-1800	**Gulf Research and Development Co., Pittsburgh, Pa. (USA)**	
	3:44060	FE—1800-21
EX-76-C-01-1806	**General Electric Co., Schenectady, N.Y. (USA). Gas Turbine Div.**	
	3:44607	FE—1806-23
EX-76-C-01-2036	**Chem Systems, Inc., New York (USA)**	
	3:44039	FE—2036-21
	3:44040	FE—2036-24
EX-76-C-01-2218	**Babcock and Wilcox Co., Lynchburg, Va. (USA). Materials and Chemical Technology Lab.**	
	3:44041	FE—2218-11
EX-76-C-01-2238	**General Electric Co., Philadelphia, Pa. (USA). Space Sciences Lab.**	
	3:44900	FE—2238-1
EX-76-C-01-2245	**Abcor, Inc., Wilmington, Mass. (USA). Walden Div.**	
	3:44061	FE—2245-16
EX-76-C-01-2270	**Catalytic, Inc., Wilsonville, Ala. (USA)**	
	3:44062	FE—2270-24
	3:44063	FE—2270-29
EX-76-C-01-2291	**Curtiss-Wright Corp., Wood-Ridge, N.J. (USA). Power Systems Div.**	
	3:44616	FE—2291-12
EX-76-C-01-2299	**Lockheed Palo Alto Research Labs., Calif. (USA)**	
	3:45053	FE—2299-15
EX-76-C-01-2305	**Gulf Research and Development Co., Pittsburgh, Pa. (USA)**	
	3:44033	FE—2305-3

Contract No.	Abstract No.	Report No.
EX-76-C-01-2315	**Chevron Research Co., Richmond, Calif. (USA)**	
	3:44065	FE—2315-19
	3:44208	FE—2315-22
EX-76-C-01-2321	**Battelle Columbus Labs., Ohio (USA)**	
	3:44066	FE—2321-31
EX-76-C-01-2322	**Mitre Corp., McLean, Va. (USA). METREK Div.**	
	3:44348	ERHQ/2322—77/4
EX-76-C-01-2337	**RAND Corp., Santa Monica, Calif. (USA)**	
	3:44725	R—2239-DOE
EX-76-C-01-2346	**Dow Chemical Co., Midland, Mich. (USA). Hydrocarbons and Energy Research Dept.**	
	3:44203	FE—2346-20
EX-76-C-01-2353	**Champion-Edison, Inc., Edison, N.J. (USA)**	
	3:44067	FE—2353-17
EX-76-C-01-2355	**Consolidated Controls Corp., El Segundo, Calif. (USA)**	
	3:44042	FE—2355-2(Rev.E)
EX-76-C-01-2386	**Scattergood School, West Branch, Iowa (USA)**	
	3:44440	DOE/NASA/CR—150553
EX-76-C-01-2416	**Badger Plants, Inc., Cambridge, Mass. (USA)**	
	3:44044	FE—2416-20
EX-76-C-01-2469	**Institute of Gas Technology, Chicago, Ill. (USA)**	
	3:44045	FE—2469-17
EX-76-S-01-2414	**Wyoming Univ., Laramie (USA). Dept. of Electrical Engineering**	
	3:44043	FE—2414-6
EX-76-S-01-2451	**Virginia Univ., Charlottesville (USA)**	
	3:44133	FE—2451-5
EX-77-C-01-2518	**Rockwell International Corp., Canoga Park, Calif. (USA). Rocketdyne Div.**	
	3:44046	FE—2518-14
EY-76-C-4-3533	**Atomics International Div., Golden, Colo. (USA). Rocky Flats Plant**	
	3:45134	RFP—2722
EY-76-C-02-0016	**Burns and Roe Industrial Services Corp., Paramus, N.J. (USA)**	
	3:44597	BNL—50777
	3:45122	BNL—50755
	3:45374	BNL—24177
	3:45379	BNL—24290
	3:45544	BNL—24136
	3:45827	BNL—24330
	3:46134	BNL—24181
EY-76-C-02-1198	**Illinois Univ., Urbana (USA)**	
	3:45118	COO—1198-1212
EY-76-C-02-2130	**Brown Univ., Providence, R.I. (USA). Dept. of Physics**	
	3:45861	COO—3130TA-341
EY-76-C-02-2922	**Avco-Everett Research Lab., Everett, Mass. (USA)**	
	3:45163	COO—2922-1
	3:45164	COO—2922-3
EY-76-C-02-2952	**United Technologies Corp., Windsor Locks, Conn. (USA). Hamilton Standard Div.**	
	3:44386	COO—2952-16
EY-76-C-02-3045-004	**Westinghouse Electric Corp., Madison, Pa. (USA). Advanced Reactors Div.**	
	3:44699	WARD-RB—3045-22
EY-76-C-02-3073	**Princeton Univ., N.J. (USA). Plasma Physics Lab.**	
	3:45905	PPPL—1440
	3:45935	PPPL—1430
EY-76-C-02-3077	**New York Univ., N.Y. (USA). Courant Mathematics and Computing Lab.**	
	3:46136	COO—3077-148
EY-76-C-02-3490	**Rochester Univ., N.Y. (USA)**	
	3:45375	UR—3490-1379
EY-76-C-03-0012	**California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology**	
	3:45367	UCLA—12-1145
	3:45371	UCLA—12-1144
EY-76-C-03-0167	**General Atomic Co., San Diego, Calif. (USA)**	
	3:44658	GA-A—14900
EY-76-C-03-0167-023	**General Atomic Co., San Diego, Calif. (USA)**	
	3:44690	GA-A—14766
	3:44807	GA-A—14748
EY-76-C-03-0167-051	**General Atomic Co., San Diego, Calif. (USA)**	
	3:44805	GA-A—14600
EY-76-C-03-0167-065	**General Atomic Co., San Diego, Calif. (USA)**	
	3:44656	GA-A—14768
	3:44657	GA-A—14863
	3:44806	GA-A—14699
EY-76-C-03-0824-025	**Atomics International Div., Canoga Park, Calif. (USA)**	
	3:44685	AI-DOE—13231
EY-76-C-03-0893-010	**General Electric Co., Sunnyvale, Calif. (USA). Fast Breeder Reactor Dept.**	
	3:44691	GEFR—00027(L)
EY-76-C-03-0893-031	**General Electric Co., Sunnyvale, Calif. (USA). Fast Breeder Reactor Dept.**	
	3:44692	GEFR—00351
EY-76-C-03-0936-048	**IRT Corp., San Diego, Calif. (USA)**	
	3:44584	SAN—0936P48-1
EY-76-C-03-1269	**R and D Associates, Marina del Rey, Calif. (USA)**	
	3:44599	SAN—1269-1(Vol.2)
EY-76-C-04-0053	**Mound Facility, Miamisburg, Ohio (USA)**	
	3:44281	MLM—2517
	3:45316	MLM—2515
EY-76-C-04-0613	**Bendix Corp., Kansas City, Mo. (USA)**	
	3:45228	BDX—613-1955(Rev.)
EY-76-C-04-0789	**Sandia Labs., Albuquerque, N.Mex. (USA)**	
	3:44051	SAND—78-0253
	3:44052	SAND—78-0653
	3:44136	SAND—78-8234
	3:44153	SAND—78-0313
	3:44272	CONF-780506—9
	3:44306	HCP/D0789—01
	3:44310	SAND—77-1029
	3:44311	SAND—77-1591
	3:44312	SAND—78-0364C
	3:44313	SAND—78-0377
	3:44468	SAND—78-0016C
	3:44596	SAND—77-1630
	3:44784	SAND—77-1737
	3:44810	SAND—78-0076
	3:44811	SAND—78-0574C
	3:44812	SAND—78-0718
	3:44813	SAND—78-0742C
	3:44847	SAND—77-8056
	3:44971	ALO—41/2
	3:44973	SAND—77-8299
	3:45014	SAND—77-8042
	3:45130	SAND—77-8275
	3:45153	SAND—77-1415C
	3:45229	SAND—77-2031
	3:46139	SAND—78-0493
	3:46140	SAND—78-0909
EY-76-C-05-0033	**Oak Ridge Associated Universities, Inc., Tenn. (USA). University Programs Office**	
	3:45133	TID—28375
EY-76-C-06-1570	**Idaho National Engineering Lab., Idaho Falls (USA)**	
	3:44731	CONF-780401—7
EY-76-C-06-1830	**Battelle Pacific Northwest Labs., Richland, Wash. (USA)**	
	3:44031	PNL—2040-9
	3:44302	PNL—2607
	3:44639	COO—4066-5
	3:45149	NUREG/CR—0073
	3:45150	PNL—2700
	3:45222	BN-SA—311
	3:45359	BNWL-tr—268
EY-76-C-06-1857	**United Nuclear Industries, Inc., Richland, Wash. (USA)**	
	3:44789	DUN-NUSAR—7824
	3:44791	HW—53612(Rev.2)
EY-76-C-07-1540	**Allied Chemical Corp., Idaho Falls, Idaho (USA). Idaho Chemical Programs - Operations Office**	
	3:44280	ICP—1148
	3:45148	ICP—1143
EY-76-C-07-1570	**Idaho National Engineering Lab., Idaho Falls (USA)**	
	3:44782	LTR—11-20(Rev.B.)
	3:44783	LTR—1144-36
	3:44785	TREE—1259
	3:45318	INEL-tr—29
EY-76-C-08-0655	**Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center**	
	3:44196	NVO—0655-105
EY-76-C-08-0669	**Eberline Instrument Corp., Santa Fe, N.Mex. (USA)**	
	3:45285	PNE-RB—79

Contract No.	Abstract No.	Report No.
EY-76-C-09-0001	**North Carolina Dept. of Natural Resources and Community Development, Raleigh (USA). Div. of Earth Resources**	
	3:44212	GJBX—51(78)
	3:44290	DP—1482
	3:45111	DPSPU—77-30-10
	3:45115	DP—1495
	3:45291	DP—1469
EY-76-C-11-0014	**Bettis Atomic Power Lab., West Mifflin, Pa. (USA)**	
	3:44697	WAPD-TM—1130
	3:44698	WAPD-TM—1134
EY-76-C-13-1658	**Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)**	
	3:45314	GJT—21
EY-76-C-14-2170	**Hanford Engineering Development Lab., Richland, Wash. (USA)**	
	3:44260	HEDL-SA—1409
	3:44694	HEDL-SA—1326
	3:44695	HEDL-SA—1391
	3:44780	HEDL-SA—1393
	3:44781	HEDL-TI—75002-9
EY-76-C-15-0003	**Westinghouse Electric Corp., Oak Ridge, Tenn. (USA). Advanced Reactors Div.**	
	3:44688	CONF-780440—1
EY-76-C-15-2395	**Westinghouse Electric Corp., Oak Ridge, Tenn. (USA). Advanced Reactors Div.**	
	3:44688	CONF-780440—1
EY-76-C-142-2170	**Hanford Engineering Development Lab., Richland, Wash. (USA)**	
	3:44693	HEDL-SA—1321
EY-76-S-01-4121	**Clemson Univ., S.C. (USA). Dept. of Civil Engineering**	
	3:44635	COO—4121-2
EY-76-S-02-1591	**Utah Univ., Salt Lake City (USA). Dept. of Materials Science and Engineering**	
	3:45065	COO—1591-32
EY-76-S-02-2212	**Minnesota Univ., Minneapolis (USA)**	
	3:45015	TID—28431
EY-76-S-02-2245	**Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering**	
	3:44689	COO—2245-36TR
EY-76-S-02-2781	**Massachusetts Inst. of Tech., Cambridge (USA)**	
	3:44799	COO—2781-14
EY-76-S-02-3158	**Cornell Univ., Ithaca, N.Y. (USA). Dept. of Materials Science and Engineering**	
	3:45055	COO—3158-62
EY-76-S-02-4070	**Pennsylvania Univ., Philadelphia (USA)**	
	3:44387	COO—4070-4
EY-76-S-05-2408	**North Carolina Univ., Chapel Hill (USA)**	
	3:45680	ORO—2408-124
EY-76-S-05-2845	**Maryland Univ., College Park (USA). Dept. of Chemical Engineering**	
	3:45127	ORO—2845-T1
EY-76-S-09-0902	**North Carolina State Univ., Raleigh (USA). Center for Marine and Coastal Studies**	
	3:45436	SRO—902-8
EY-77-C-06-1030	**Atomics International Div., Richland, Wash. (USA). Rockwell Hanford Operations**	
	3:44292	RHO-CD—78(Rev.)
EY-77-S-02-4502	**Pittsburgh Univ., Pa. (USA). Dept. of Civil Engineering**	
	3:44085	COO—4502-2
EY-77-S-09-0980	**Oregon State Univ., Corvallis (USA)**	
	3:45290	CONF-780611—3
NAS-7-100-954355	**Mobil Tyco Solar Energy Corp., Waltham, Mass. (USA)**	
	3:44356	DOE/JPL/954355—4
NAS-7-100-954589	**Westinghouse Electric Corp., Trafford, Pa. (USA). Power Circuit Breaker Div.**	
	3:44357	DOE/JPL/954589—3
NAS-7-100-954898	**Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif. (USA)**	
	3:44358	DOE/JPL/954898—1
W-31-109-ENG-38	**Argonne National Lab., Ill. (USA)**	
	3:44072	CONF-7710101—11
	3:44088	ANL/AA—6(Vol.2)(DRAFT)
	3:44089	CONF-780213—11
	3:44093	ANL/AA—11(Vol.1)(Draft)
	3:44122	CONF-7710101—9
	3:44131	ANL/CEN/FE—77-8
	3:44132	CONF-780307—8
	3:44301	DOE/EV—0005/7
	3:44622	CONF-771231—3
	3:44686	ANL—77-82
	3:44687	ANL—78-41
	3:44778	ANL—77-46
	3:44786	ZPR-TM—312
	3:44798	CONF-771126—8
	3:44836	ANL/ES—64
	3:44902	CONF-780336—1
	3:45138	CONF-780339—3
	3:45162	CONF-780202—21
	3:45268	NUREG/CR—0054
	3:45327	ANL/WR—77-2
	3:45360	ANL/WR—77-3
W-74-05-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
	3:44055	UCRL—50032-77
W-7405-ENG-26	**Oak Ridge National Lab., Tenn. (USA)**	
	3:44021	ORNL—5387
	3:44214	K/UR—12
	3:44259	CONF-780535—1
	3:44261	ORNL/TM—6321
	3:44273	CONF-780506—22
	3:44274	Y/OA—2034
	3:44275	Y/OWI/SUB—77/42513
	3:44282	ORNL/TM—6388
	3:44297	ORNL-tr—4567
	3:44304	ORNL-tr—4598
	3:44724	ORNL/TM—6331
	3:44732	CONF-780403—3
	3:44760	ORNL/Sub—2913/7
	3:44761	ORNL/TM—6191/V1
	3:44808	ORNL/NUREG—35
	3:44809	ORNL/NUREG/TM—178
	3:45013	ORNL—5386
	3:45317	ORNL—5382
	3:45319	ORNL-tr—4543
	3:45369	CONF-780445—1
	3:45370	CONF-780445—2
	3:45402	ORNL/NUREG/TM—84
	3:45406	ORNL/EIS—124
	3:45434	CONF-780314—2
	3:45772	ORNL/TM—6245
	3:45773	ORNL/TM—6246
	3:45808	ORNL-tr—4653
	3:46084	ORNL/Sub—7117/24
	3:46085	ORNL/Sub—7117/25
W-7405-ENG-36	**Los Alamos Scientific Lab., N.Mex. (USA)**	
	3:44050	LA—7277-MS
	3:44200	LA—6901-PR
	3:44210	LA-tr—78-26
	3:44215	LA—7180-MS
	3:44216	LA—7296-PR
	3:44308	LA—7212-MS
	3:44327	LA—7234-PR
	3:44734	LA—7271-PR
	3:44834	LA-UR—77-2754
	3:45147	LA—6969-PR
	3:45152	LA-UR—78-1210
	3:45166	LA-UR—78-931
	3:45287	LA-tr—78-48
	3:45315	LA—7263-MS
	3:45323	LA—7216-MS
	3:45395	LA—7196-MS
	3:45396	LA-UR—78-1205
	3:45401	LA-tr—77-73B
	3:45450	LA-UR—78-1199
	3:45830	LA-tr—77-72
	3:45832	LA—7291-MS
	3:46082	LA—7125-MS
W-7405-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
	3:44054	UCID—17759
	3:44056	UCRL—80592
	3:44193	UCRL—80328
	3:44293	UCRL—13835
	3:44294	UCRL—13837
	3:44295	UCRL—13839
	3:44314	

Contract No.	Abstract No.	Report No.
		UCRL—81005
	3:44388	LBL—5962
	3:44573	UCRL-Trans—1547
	3:44579	LBL—6815
	3:44593	UCRL—13832
	3:44594	UCRL—13849
	3:44602	LBL—6889
	3:44776	UCID—17744-78-2
	3:44815	UCID—17782
	3:44817	UCRL—52342
	3:44818	UCRL—52435
	3:44927	UCRL-Trans—1548
	3:44938	LBL—7817
	3:45010	LBL—6998
	3:45076	UCRL—80390
	3:45078	UCRL—50019-77-1
	3:45109	UCRL—13826
	3:45110	UCRL—80878
	3:45129	LBL—6898
	3:45132	UCRL—50016-78-1
	3:45136	UCRL—52449
	3:45224	UCRL—52431
	3:45254	LBL—7205
	3:45281	UCID—17822
	3:45303	UCRL—52426
	3:45381	UCRL—80340(Rev.1)
	3:45433	UCRL—80539
	3:45549	LBL—7204
	3:45866	LBL—7291
	3:45888	UCRL-Trans—11347
	3:46086	UCRL—13834
	3:46127	UCRL—13801
	3:46138	LBL—7256
	3:46141	UCID—3994
	3:46142	UCID—17749
W-7405-ENG-82	**Ames Lab., Iowa (USA)**	
	3:44213	IS—4370
	3:44958	IS-M—145
	3:45112	IS—4353
	3:45845	IS-M—137
W-7405-ENG-92-095	**Battelle Columbus Labs., Ohio (USA)**	
	3:44390	TID—27802

REPORT NUMBER INDEX

The numbers assigned to all reports cited in the publication appear in the first column of the index. The citation numbers (volume:citation number) are included in the second column. Cross reference information and/or availability are included as appropriate. Abbreviations used in the availability column are elaborated at the end of the index.

Report No.	*Abstract No.*	*Availability*
AD-A-		
046954	3:44570	NTIS PCA03/MF A01
046975	3:45432	NTIS PCA06/MF A01
047262	3:45242	NTIS PCA04/MF A01
047287	3:45480	University of New England, Armidale, Australia
048278	3:44627	NTIS PCA02/MF A01
048311	3:45798	NTIS PCA22/MF A01
048324	3:44947	NTIS PCA07/MF A01
048330	3:44851	NTIS PCA02/MF A01
048334	3:45326	NTIS PCA04/MF A01
048361	3:45156	NTIS PCA04/MF A01
048432	3:45485	NTIS PCA03/MF A01
048442	3:45851	NTIS PCA03/MF A01
048446	3:45852	NTIS PCA03/MF A01
048447	3:45157	NTIS PCA03/MF A01
048485	3:45001	NTIS PCA06/MF A01
048588	3:45002	NTIS PCA05/MF A01
048621	3:45158	NTIS PCA03/MF A01
048628	3:45481	NTIS PCA03/MF A01
048643	3:45159	NTIS PCA02/MF A01
048648	3:45426	NTIS PCA04/MF A01
048662	3:45160	NTIS PCA02/MF A01
048734	3:44921	
048750	3:45289	NTIS PCA03/MF A01
048751	3:45500	NTIS PCA02/MF A01
048752	3:45482	NTIS PCA03/MF A01
048753	3:45933	NTIS PCA03/MF A01
048772	3:45007	
048773	3:45008	
048778	3:45283	Availability: Microfiche copies only.
048779	3:45161	NTIS PCA04/MF A01
048780	3:44324	NTIS PCA04/MF A01
048802	3:45286	NTIS PCA08/MF A01
AECL-		
4436/1	3:44661	Dep. NTIS (US Sales Only), PC A17/MF A01
4436/2	3:44264	Dep. NTIS (US Sales Only), PC A15/MF A01
5305	3:44730	Dep. NTIS (US Sales Only), PC A06/MF A01
5391	3:44662	Dep. NTIS (US Sales Only), PC A03/MF A01
5399	3:44777	Dep. NTIS (US Sales Only), PC A03/MF A01
5400	3:44770	Dep. NTIS (US Sales Only), PC A05/MF A01
5626	3:45009	Dep. NTIS (US Sales Only), PC A03/MF A01
5679	3:44663	Dep. NTIS (US Sales Only), PC A02/MF A01
5680	3:44664	Dep. NTIS (US Sales Only), PC A02/MF A01
5689	3:44869	Dep. NTIS (US Sales Only), PC A03/MF A01
5694	3:44793	Dep. NTIS (US Sales Only), PC A02/MF A01
5823	3:44668	Dep. NTIS (US Sales Only), PC A03/MF A01
5824	3:44669	Dep. NTIS (US Sales Only), PC A02/MF A01
5825	3:44670	Dep. NTIS (US Sales Only), PC A03/MF A01
5826	3:44671	Dep. NTIS (US Sales Only), PC A02/MF A01
5833	3:44672	Dep. NTIS (US Sales Only), PC A03/MF A01
5850	3:44771	Dep. NTIS (US Sales Only), PC A03/MF A01
5852	3:44673	Dep. NTIS (US Sales Only), PC A04/MF A01
5853	3:44674	Dep. NTIS (US Sales Only), PC A03/MF A01
5902	3:44305	Dep. NTIS (US Sales Only), PC A02/MF A01
5903	3:45246	Dep. NTIS (US Sales Only), PC A03/MF A01
5904	3:44675	Dep. NTIS (US Sales Only), PC A03/MF A01
5913	3:44676	Dep. NTIS (US Sales Only), PC A03/MF A01
AED-Conf-		
76-399-002	3:44606	Dep. NTIS (US Sales Only), PC A03/MF A01
76-407-006	3:44630	Dep. NTIS (US Sales Only), PC A02/MF A01
1977-072-007	3:44922	Dep. NTIS (US Sales Only), PC A02/MF A01
1977-197-009	3:45085	Dep. NTIS (US Sales Only), PC A02/MF A01
AERE-TP-		
714	3:44772	Dep. NTIS (US Sales Only), PC A02/MF A01
AFIT/GEP/PH-		
77-1	3:45156	*See* AD-A-048361
AFWL-TR-		
77-53	3:45283	*See* AD-A-048778
77-104	3:44324	*See* AD-A-048780
AI-DOE-		
13231	3:44685	AT
AIAU-		
77503	3:44265	Dep. NTIS (US Sales Only), PC A02/MF A01
ALO-		
41/2	3:44971	Dep. NTIS, PC A03/MF A01
ANL-		
77-46	3:44778	AT
77-82	3:44686	Dep. NTIS (US Sales Only), PC A03/MF A01
78-32	3:45268	*See* NUREG/CR-0054
78-41	3:44687	Dep. NTIS, PC A04/MF A01
ANL/AA-		
6(Vol.2)(DRAFT)	3:44088	Dep. NTIS, PC A09/MF A01
11(Vol.1)(Draft)	3:44093	Dep. NTIS, PC A06/MF A01
ANL/CEN/FE-		
77-8	3:44131	Dep. NTIS, PC A05/MF A01

Report No.	Abstract No.	Availability
ANL/ES-		
64	3:44836	Dep. NTIS, PC A03/MF A01
ANL-Trans-		
1130	3:45084	Dep. NTIS, PC A02/MF A01
1131	3:44189	Dep. NTIS, PC A03/MF A01
ANL/WR-		
77-2	3:45327	Dep. NTIS, PC A07/MF A01
77-3	3:45360	Dep. NTIS, PC A04/MF A01
ARI-RR-		
110.1	3:45481	*See* AD-A-048628
BCL-OA-TFR-		
77-1	3:44966	*See* N-77-33683
BCR-L-		
886(Vol.2)	3:44035	*See* FE-1527-43(Vol.2)
886(Vol.3)	3:44036	*See* FE-1527-43(Vol.3)
BDX-		
613-1955(Rev.)	3:45228	Dep. NTIS, PC A02/MF A01
BERC/IC-		
77/3	3:44207	Dep. NTIS, PC A02/MF A01
BN-SA-		
311	3:45222	Dep. NTIS, MF A01
BNL-		
24136	3:45544	Dep. NTIS, PC A06/MF A01
24177	3:45374	Dep. NTIS, PC A02/MF A01
24181	3:46134	Dep. NTIS, PC A02/MF A01
24290	3:45379	Dep. NTIS, PC A02/MF A01
24330	3:45827	Dep. NTIS, PC A02/MF A01
50755	3:45122	Dep. NTIS, PC A03/MF A01
50777	3:44597	Dep. NTIS, PC A03/MF A01
BNWL-tr-		
268	3:45359	Dep. NTIS, PC A03/MF A01
311	3:44303	Dep. NTIS, PC A02/MF A01
317	3:44708	Dep. NTIS (US Sales Only), PC A03/MF A01
319	3:44266	Dep. NTIS, PC A02/MF A01
CANMET-		
76-19	3:44289	Dep. NTIS (US Sales Only), PC A05/MF A01
CED-		
78-93	3:45328	General Accounting Office, Washington, DC
78-99	3:45155	General Accounting Office, Washington, DC
78-107	3:44883	General Accounting Office, Washington, DC
CERL-TR-E-		
119-VOL-1	3:44921	*See* AD-A-048734
CIRC-		
754	3:44199	Geological Survey, Arlington, VA
CMR-		
77-15	3:44851	*See* AD-A-048330
CMS-RANN-		
1-77	3:45332	*See* PB-275692
CONF-731241-		(Conference on heavy metals in the aquatic environment, Nashville, TN, USA, Dec 1973)
	3:45338	Elmsford, NY; Pergamon Press Inc. (1975). $50.00
CONF-740349-		(167. national meeting of the American Chemical Society, Los Angeles, CA, USA, 31 Mar-5 Apr 1974)
P7	3:44981	Washington, DC; American Chemical Society (1975). $19.95
CONF-741074-		(Fall conference of American Society for Nondestructive Testing, Detroit, MI, USA, 21-24 Oct 1974)
2	3:45222	*See* BN-SA-311
CONF-7410177-		(Annual meeting of the Geochemical Society of Japan, Tokyo, Japan, 3 Oct 1974)
3	3:44586	TIC
CONF-751265-		(Seminar on in-stack particle sizing for particulate control device evaluation, Research Triangle Park, NC, USA, 3-4 Dec 1975)
	3:45235	*See* PB-266103
CONF-760164-		(Symposium on enzymes in the food processing industry, Davis, CA, USA, 14 Jan 1976)
1	3:44388	*See* LBL-5962
CONF-760578-		(Seminar on radiation biology and protection, Orsay, France, 24-26 May 1976)
	3:45400	European Community Information Service, Washington, DC
CONF-760688-		(16. annual meeting on control of reactor radiation fields, Toronto, Ontario, Canada, 13-16 Jun 1976)
	3:44729	Canadian Nuclear Association, Toronto, Ontario
CONF-760769-		(6. congress on catalysis, Imperial College, UK, 12-16 Jul 1976)
	3:45119	London; Chemical Society (1977).
CONF-7608107-		(Summer energy conversion technology meeting, Tokyo, Japan, Aug 1976)
1	3:44578	TIC
CONF-7609113-		(Congress on rational energy utilities in urban systems with specialized exhibition at the German Industrial Exhibition, Berlin, F.R. Germany, 18 Sep 1976)
3	3:44630	*See* AED-Conf-76-407-006
CONF-7609177-		(Meeting on the status and prospects of thermal breeders, Vienna, Austria, 15 Sep 1976)
1	3:44663	*See* AECL-5679
CONF-7610101-		(59. VDE general meeting, Muenchen, F.R. Germany, 11 Oct 1976)
2	3:44606	*See* AED-Conf-76-399-002
CONF-7610123-		(Annual meeting of the Geochemical Society of Japan, Nagoya, Japan, 25 Oct 1976)
4	3:44601	TIC
5	3:44587	TIC
6	3:44574	TIC
CONF-761155-		(4. workshop on laser interaction and related plasma phenomena, Troy, NY, USA, 8-12 Nov 1976)
P1	3:46119	New York; Plenum Publishing Corp. (1977). $10.00
CONF-761193-		(Symposium on the radiobiological research needed for the improvement of radiotherapy, Vienna, Austria, 22-26 Nov 1976)
P1	3:45398	*See* STI/PUB-441(Vol.1)
P2	3:45399	*See* STI/PUB-441(Vol.2)
CONF-761220-		(Solar cooling and heating forum, Miami Beach, FL, USA, 13-15 Dec 1976)
	3:44402	Dep. NTIS, PC A18/MF A01
CONF-770402-		(The US-USSR Steering Committee for cooperation in MHD, Washington, DC, USA, 13-21 Apr 1977)
3	3:44901	Dep. NTIS, PC A03/MF A01
CONF-770448-		(American Society of Civil Engineers spring convention, Dallas, TX, USA, 25-29 Apr 1977)
2	3:44957	American Society of Civil Engineers, New York, $1.00
3	3:44956	American Society of Civil Engineers, New York, $1.00
CONF-770480-		(Uranium-thorium symposium, Golden, CO, USA, 27-28 Apr 1977)
(Absts.)	3:44217	*See* USGS-CIRC-753
CONF-770484-		(Scanning electron microscope symposium, Los Angeles, CA, USA, 18-19 Apr 1977)
1	3:44193	*See* UCRL-80328
CONF-7706110-		(Energy related environmental computer and graphics systems conference, Germantown, MD, USA, 6-7 Jun 1977)
	3:46135	Dep. NTIS, MF A01
CONF-7706113-		(DECHEMA annual meeting, Frankfurt am Main, F.R. Germany, 23-24 Jun 1977)
3	3:45085	*See* AED-Conf-1977-197-009
CONF-7706126-		(17. Canadian Nuclear Association conference, Montreal, Quebec, Canada, 5 Jun 1977)
5	3:44305	*See* AECL-5902
CONF-7706133-		(IAEA specialists meeting, Vienna, Austria, 27 Jun 1977)
1	3:44771	*See* AECL-5850
CONF-770709-		(10. international conference on high energy accelerators, Serpukhov, USSR, 11-17 Jul 1977)
22	3:45246	*See* AECL-5903
CONF-770754-		(6. meeting on pollution and resources, Tokyo, Japan, 21-22 Jul 1977)
1	3:44595	TIC
CONF-770757-		(Midyear meeting, Nashville, TN, USA, 10-13 Jul 1977)
	3:44150	Interstate Oil Compact Commission, Oklahoma City, OK

Report No.	Abstract No.	Availability
CONF-770761-		(4. symposium on multivariable technological systems, Fredericton, Canada, Jul 1977)
1	3:44664	*See* AECL-5680
CONF-770807-		(4. international conference on structural mechanics in reactor technology, San Francisco, CA, USA, 15-19 Aug 1977)
57	3:44671	*See* AECL-5826
CONF-770814-		(American Chemical Society meeting, Chicago, IL, USA, 29 Aug-2 Sep 1977)
13	3:44123	*See* IS-ICP-50
14	3:44029	*See* IS-ICP-48
CONF-7709131-		(Symposium on nuclear plant maintainability, Montreal, Quebec, Canada, Sep 1977)
1	3:44676	*See* AECL-5913
CONF-771015-		(Fall meeting of the Western States Section of the Combustion Institute, Palo Alto, CA, USA, 17-18 Oct 1977)
17	3:45230	William C. Pfefferle, Middletown, NJ
CONF-7710101-		(5. national conference on energy and the environment, Cincinnati, OH, USA, 31 Oct-3 Nov 1977)
9	3:44122	Dep. NTIS, PC A03/MF A01
11	3:44072	Dep. NTIS, PC A02/MF A01
CONF-771123-		(BNES conference on optimization of sodium cooled fast reactors, London, UK, 28 Nov-1 Dec 1977)
3	3:44693	*See* HEDL-SA-1321
CONF-771126-		(5. water reactor safety research information meeting, Gaithersburg, MD, USA, 7-11 Nov 1977)
8	3:44798	Dep. NTIS, PC A02/MF A01
CONF-771165-		(Conference on metals science; the emerging frontiers, Varanasi, India, 23-27 Nov 1977)
1	3:45010	*See* LBL-6998
CONF-771222-		(IAEA symposium on natural fission reactors, Paris, France, 19-21 Dec 1977)
8	3:44210	*See* LA-tr-78-26
CONF-771231-		(4. workshop on entrainment and impingement, Chicago, IL, USA, 5-7 Dec 1977)
3	3:44622	Dep. NTIS, PC A02/MF A01
CONF-780202-		(Topical meeting on inertial confinement fusion, San Diego, CA, USA, 7 Feb 1978)
21	3:45162	Dep. NTIS, PC A02/MF A01
CONF-780213-		(107. AIME meeting, Denver, CO, USA, 26 Feb-2 Mar 1978)
10	3:44694	*See* HEDL-SA-1326
11	3:44089	Dep. NTIS, PC A02/MF A01
CONF-780235-		(Wire chamber conference, Vienna, Austria, 14-16 Feb 1978)
1	3:45254	*See* LBL-7205
CONF-780307-		(17. symposium on engineering aspects of MHD, Stanford, CA, USA, 27-29 Mar 1978)
8	3:44132	Dep. NTIS, MF A01
CONF-780314-		(9. lunar science conference, Houston, TX, USA, Mar 1978)
2	3:45434	Dep. NTIS, PC A03/MF A01
4	3:45433	*See* UCRL-80539
CONF-780318-		(2. conference on high-temperature plasma diagnostics, Santa Fe, NM, USA, 1-3 Mar 1978)
1	3:45935	*See* PPPL-1430
CONF-780324-		(SPIE '78 seminars, Washington, DC, USA, 28-31 Mar 1978)
5	3:45166	*See* LA-UR-78-931
6	3:44260	*See* HEDL-SA-1409
CONF-780328-		(Conference on information sciences and systems, Baltimore, MD, USA, 29-31 Mar 1978)
2	3:46134	*See* BNL-24181
CONF-780336-		(2. seminar on MHD flows and turbulence, Beer-Sheva, Israel, 28-31 Mar 1978)
1	3:44902	Dep. NTIS, PC A02/MF A01
CONF-780339-		(Conference on future trends in superconductive electronics, Charlottesville, VA, USA, 23-25 Mar 1978)
3	3:45138	Dep. NTIS, PC A02/MF A01
CONF-780401-		(Topical meeting on advances in reactor physics, Gatlinburg, TN, USA, 9-12 Apr 1978)
7	3:44731	Dep. NTIS, PC A02/MF A01
8	3:44786	*See* ZPR-TM-312
9	3:44780	*See* HEDL-SA-1393
CONF-780403-		(IEEE international conference on acoustics, speech and signal processing, Tulsa, OK, USA, 10-12 Apr 1978)
3	3:44732	Dep. NTIS, PC A02/MF A01
CONF-780417-		(Western States Section/Combustion Institute, Boulder, CO, USA, 17-18 Apr 1978)
6	3:45129	*See* LBL-6898
8	3:44056	*See* UCRL-80592
CONF-780430-		(Conference on metallurgical coatings, San Francisco, CA, USA, 3-7 Apr 1978)
6	3:44695	*See* HEDL-SA-1391
CONF-780440-		(American power conference, Chicago, IL, USA, Apr 1978)
1	3:44688	Dep. NTIS, PC A02/MF A01
CONF-780444-		(Meeting of the nikkei center, Tokyo, Japan, 10 Apr 1978)
1	3:44875	Dep. NTIS (US Sales Only), PC A02/MF A01
CONF-780445-		(NATO course on chromatin, Sicily, Italy, 12 Apr 1978)
1	3:45369	NTIS MF A01
2	3:45370	Dep. NTIS, PC A02/MF A01
CONF-780448-		(International council for the exploration of the sea, Las Palmas, Spain, 14-16 Apr 1978)
1	3:45374	*See* BNL-24177
CONF-780451-		(Conference on BL LAC objects, Pittsburgh, PA, USA, 24-26 Apr 1978)
1	3:45450	*See* LA-UR-78-1199
CONF-780453-		(Neutrinos, West Lafayette, IN, USA, 28 Apr-2 May 1978)
2	3:45861	*See* COO-3130TA-341
CONF-780506-		(5. symposium on packaging and transportation of radioactive materials, Las Vegas, NV, USA, 7-12 May 1978)
9	3:44272	Dep. NTIS, PC A02/MF A01
10	3:45152	*See* LA-UR-78-1210
19	3:45153	*See* SAND-77-1415C
22	3:44273	Dep. NTIS, PC A02/MF A01
24	3:44274	*See* Y/OA-2034
CONF-780509-		(19. symposium on rock mechanics, Lake Tahoe, NV, USA, 1-3 May 1978)
5	3:45076	*See* UCRL-80390
CONF-780526-		(ANS safety meeting, Newport Beach, CA, USA, 7-11 May 1978)
2	3:44811	*See* SAND-78-0574C
CONF-780527-		(4. energy symposium, Los Angeles, CA, USA, 23 May 1978)
1	3:44468	*See* SAND-78-0016C
CONF-780529-		(3. meeting concerning the role of behavioral, Arlington, VA, USA, 2-4 May 1978)
1	3:44314	*See* UCRL-81005
CONF-780534-		(6. symposium on microdosimetry, Brussels, Belgium, May 1978)
1	3:45396	*See* LA-UR-78-1205
4	3:45827	*See* BNL-24330
CONF-780535-		(Meeting on fuel element development programs, Richland, WA, USA, 2-4 May 1978)
1	3:44259	Dep. NTIS, PC A02/MF A01
CONF-780538-		(Symposium on nuclear activation techniques in the life sciences, Vienna, Austria, 22-26 May 1978)
2	3:45379	*See* BNL-24290
CONF-780602-		(65. conference of American Electroplaters' Society, Washington, DC, USA, Jun 1978)
1	3:45014	*See* SAND-77-8042
CONF-780606-		(Institute of Nuclear Materials Management meeting, Cincinnati, OH, USA, 27-29 Jun 1978)
1	3:44312	*See* SAND-78-0364C
CONF-780607-		(Conference on the performance of computer installations, Gardone, Riviera, Italy, 22-23 Jun 1978)
1	3:46138	*See* LBL-7256
CONF-780609-		(ASME/CSME pressure vessels and piping conference, Montreal, Canada, 25-29 Jun 1978)
4	3:44813	*See* SAND-78-0742C
CONF-780611-		(AIChE symposium, Philadelphia, PA, USA, 4-8 Jun 1978)
3	3:45290	Dep. NTIS, PC A03/MF A01
CONF-780612-		(Symposium on advances in radiation protection monitoring, Stockholm, Sweden, 26-30 Jun 1978)
3	3:45381	*See* UCRL-80340(Rev 1)

Report No.	Abstract No.	Availability
COO-		
1198-1212	3:45118	Dep. NTIS, PC A05/MF A01
1591-32	3:45065	Dep. NTIS, PC A03/MF A01
2245-36TR	3:44689	Dep. NTIS, MF A01
2781-14	3:44799	Dep. NTIS, PC A02/MF A01
2922-1	3:45163	Dep. NTIS, PC A02/MF A01
2922-3	3:45164	Dep. NTIS, PC A02/MF A01
2952-16	3:44386	Dep. NTIS, MF A01
3077-148	3:46136	Dep. NTIS, PC A09/MF A01
3130TA-341	3:45861	Dep. NTIS, MF A01
3158-62	3:45055	NTIS MFA01
4066-5	3:44639	Dep. NTIS, PC A05/MF A01
4070-4	3:44387	Dep. NTIS, PC A03/MF A01
4121-2	3:44635	Dep. NTIS, PC A17/MF A01
4181-1	3:46081	Dep. NTIS, PC A13/MF A01
4227-4	3:44074	Dep. NTIS, PC A02/MF A01
4251-6	3:45165	Dep. NTIS, PC A03/MF A01
4261-4	3:44800	Dep. NTIS, PC A02/MF A01
4385-1	3:45831	Dep. NTIS, PC A02/MF A01
4502-2	3:44085	Dep. NTIS, PC A02/MF A01
4531-1	3:44611	Dep. NTIS, PC A05/MF A01
DES-		
77-1	3:44329	Dep. NTIS, PC A16/MF A01
DOCKET-50309-		
855	3:44715	
DOE/EDP-		
0024	3:44185	Dep. NTIS, PC A09/MF A01
DOE/EIS-		
0018-D	3:45324	W.H. Pennington, Washington, DC
DOE/ERA-		
0006(Vol.2)	3:44186	Dep. NTIS, PC A21/MF A01
DOE/ET-		
0014	3:44849	Dep. NTIS, PC A08/MF A01
0046	3:44326	Dep. NTIS, PC A04/MF A01
DOE/EV-		
0005/7	3:44301	Dep. NTIS, PC A05/MF A01
0006	3:46137	Dep. NTIS, PC A04/MF A01
DOE/JPL/954355-		
4	3:44356	Dep. NTIS, PC A06/MF A01
DOE/JPL/954589-		
3	3:44357	Dep. NTIS, PC A03/MF A01
DOE/JPL/954898-		
1	3:44358	Dep. NTIS, PC A04/MF A01
DOE/NASA/CR-		
150553	3:44440	Dep. NTIS, MF A01
DOW/SRPR-		
20	3:44203	*See* FE-2346-20
DP-		
1469	3:45291	Dep. NTIS, PC A04/MF A01
1482	3:44290	Dep. NTIS, PC A02/MF A01
1490	3:44212	*See* GJBX-51(78)
1495	3:45115	Dep. NTIS, PC A02/MF A01
DPSPU-		
77-30-10	3:45111	Dep. NTIS, PC A02/MF A01
DUN-NUSAR-		
7824	3:44789	Dep. NTIS, PC A05/MF A01
E-		
9102	3:45066	*See* N-77-33348
9357	3:45067	*See* N-77-33929
9361	3:46083	*See* N-77-34000
ECON-		
77-158-2	3:46081	*See* COO-4181-1
EMD-		
78-23	3:44092	General Accounting Office, Washington, DC
ENDF-		
264	3:45773	*See* ORNL/TM-6246
EPA-		
450/1-77-002	3:45292	Environmental Protection Agency, Research Triangle Park, NC
600/2-77-060	3:45235	*See* PB-266103
EPA/450/2-		
77/022	3:45322	*See* PB-274557
EPA/530/SW-		
145	3:44964	*See* PB-274881
EPA/600/1-		
77/043	3:45422	*See* PB-274339
EPRI-AF-		
665	3:44613	Dep. NTIS, PC A07/MF A01
EPRI-EA-		
634-SR	3:44876	Dep. NTIS, PC A08/MF A01
725	3:44276	Dep. NTIS, PC A15/MF A01
EPRI-EL-		
577	3:45139	Dep. NTIS, PC A99/MF A01
690	3:44631	Dep. NTIS, PC A10/MF A01
720	3:44632	Dep. NTIS, PC A06/MF A01
726	3:44628	Dep. NTIS, PC A09/MF A01
738	3:44633	Dep. NTIS, PC A05/MF A01
776	3:44629	Dep. NTIS, PC A08/MF A01
EPRI-NP-		
692	3:44647	Dep. NTIS, PC A11/MF A01
734(Pt.2)	3:44801	Dep. NTIS, MF A01
757	3:44802	Dep. NTIS, PC A06/MF A01
783	3:44773	Dep. NTIS, PC A06/MF A01
800	3:44803	Dep. NTIS, PC A07/MF A01
ERHQ/2322-		
77/4	3:44348	Dep. NTIS, PC A03/MF A01
EUR-		
5369	3:44790	Dep. NTIS (US Sales Only), PC A11/MF A01
5456	3:44779	Dep. NTIS (US Sales Only), PC A05/MF A01
5510e	3:44696	*See* KFK-2483
5605	3:44648	Dep. NTIS (US Sales Only), PC A05/MF A01
5640	3:44804	Dep. NTIS (US Sales Only), PC A03/MF A01
5649	3:44640	Dep. NTIS (US Sales Only), PC A02/MF A01
5651	3:44641	Dep. NTIS (US Sales Only), PC A05/MF A01
5725e	3:45400	European Community Information Service, Washington, DC
5749	3:44277	Dep. NTIS (US Sales Only), PC A05/MF A01
5801	3:44279	Dep. NTIS (US Sales Only), PC A09/MF A01
EXXON/GRU-		
1BH-77(Vol.1)	3:44908	*See* N-77-33608
2BH.77(Vol.2)	3:44909	*See* N-77-33609
FE-		
1237-T-7	3:44614	Dep. NTIS, PC A03/MF A01
1527-43(Vol.2)	3:44035	Dep. NTIS, MF A01
1527-43(Vol.3)	3:44036	Dep. NTIS, MF A01
1545-44	3:44037	Dep. NTIS, PC A06/MF A01
1765-42	3:44615	Dep. NTIS, PC A03/MF A01
1787-8	3:45231	Dep. NTIS, PC A03/MF A01
1794-25	3:44038	Dep. NTIS, PC A04/MF A01
1800-21	3:44060	Dep. NTIS, PC A04/MF A01
1806-23	3:44607	Dep. NTIS, PC A08/MF A01
2036-21	3:44039	Dep. NTIS, PC A03/MF A01
2036-24	3:44040	Dep. NTIS, PC A03/MF A01
2218-11	3:44041	Dep. NTIS, PC A06/MF A01
2238-1	3:44900	Dep. NTIS, PC A07/MF A01
2245-16	3:44061	Dep. NTIS, PC A07/MF A01
2270-24	3:44062	Dep. NTIS, PC A09/MF A01
2270-29	3:44063	Dep. NTIS, PC A02/MF A01
2291-12	3:44616	Dep. NTIS, PC A04/MF A01
2299-15	3:45053	Dep. NTIS, PC A03/MF A01
2305-3	3:44033	Dep. NTIS, PC A02/MF A01
2306-12	3:44064	Dep. NTIS, PC A03/MF A01
2315-19	3:44065	Dep. NTIS, PC A05/MF A01
2315-22	3:44208	Dep. NTIS, PC A04/MF A01
2321-31	3:44066	Dep. NTIS, MF A01
2346-20	3:44203	Dep. NTIS, PC A03/MF A01
2353-17	3:44067	Dep. NTIS, PC A03/MF A01
2355-2(Rev.E)	3:44042	Dep. NTIS, PC A03/MF A01
2414-6	3:44043	Dep. NTIS, PC A04/MF A01
2416-20	3:44044	Dep. NTIS, PC A02/MF A01
2451-5	3:44133	Dep. NTIS, PC A03/MF A01
2469-17	3:44045	Dep. NTIS, PC A03/MF A01
2518-14	3:44046	Dep. NTIS, PC A04/MF A01
2579-13	3:44028	Dep. NTIS, PC A03/MF A01
2583-13	3:44608	Dep. NTIS, PC A02/MF A01
2666-2	3:44047	Dep. NTIS, PC A03/MF A01
2727-1	3:44068	Dep. NTIS, PC A03/MF A01
2729-1	3:44048	Dep. NTIS, PC A03/MF A01
3800-13	3:44049	Dep. NTIS, PC A03/MF A01
SFMP-1(78)	3:44094	Dep. NTIS, PC A03/MF A01
FEA/D-		
76/291	3:44954	$GPO $3.40
77/243	3:44955	Dep. NTIS, PC A03/MF A01
FES-		
77-1	3:44330	Dep. NTIS, PC A12/MF A01
FSRP-FPL-		
303	3:44627	*See* AD-A-048278

Report No.	Abstract No.	Availability
FTD-ID(RS)T-		
1069-77	3:45798	*See* AD-A-048311
1342-77	3:45426	*See* AD-A-048648
GA-A-		
14600	3:44805	Dep. NTIS, PC A04/MF A01
14699	3:44806	Dep. NTIS, PC A05/MF A01
14748	3:44807	Dep. NTIS, PC A07/MF A01
14766	3:44690	Dep. NTIS, PC A04/MF A01
14768	3:44656	Dep. NTIS, PC A03/MF A01
14863	3:44657	Dep. NTIS, PC A15/MF A01
14900	3:44658	Dep. NTIS, MF A01
GEFR-		
00027(L)	3:44691	AT
00351	3:44692	AT
GJBX-		
51(78)	3:44212	Dep. NTIS, PC A08/MF A01
62-78	3:44214	*See* K/UR-12
69(78)	3:44215	*See* LA-7180-MS
72(78)	3:44216	*See* LA-7296-PR
GJT-		
21	3:45314	Dep. NTIS, PC A06/MF A01
GPAC-		
82	3:44959	*See* PB-274136
GSS-		
76-83	3:45299	*See* PB-275760
HCP/D0789-		
01	3:44306	Dep. NTIS, PC A05/MF A01
HCP/M6037-		
01	3:44952	Dep. NTIS, PC A06/MF A01
HEDL-SA-		
1321	3:44693	Dep. NTIS, PC A03/MF A01
1326	3:44694	Dep. NTIS, PC A03/MF A01
1391	3:44695	Dep. NTIS, PC A02/MF A01
1393	3:44780	Dep. NTIS, PC A02/MF A01
1409	3:44260	Dep. NTIS, PC A02/MF A01
HEDL-TI-		
75002-9	3:44781	AT
HMI-B-		
188	3:45108	Dep. NTIS (US Sales Only), PC A06/MF A01
235	3:46090	Dep. NTIS (US Sales Only), PC A04/MF A01
HW-		
53612(Rev.2)	3:44791	Dep. NTIS, PC A06/MF A01
IAE-		
2526	3:44733	Dep. NTIS (US Sales Only), PC A02/MF A01
IAEA-SM-		
229/SM	3:45381	*See* UCRL-80340(Rev.1)
ICP-		
1143	3:45148	Dep. NTIS, PC A04/MF A01
1148	3:44280	Dep. NTIS, PC A03/MF A01
ILR-		
18	3:44903	*See* N-77-33468
IMMR-		
29-PD18-77	3:44126	*See* PB-274406
31-PD19-77	3:44125	*See* PB-274405
INEL-tr-		
29	3:45318	Dep. NTIS, PC A04/MF A01
IPPJ-		
260	3:45945	*See* N-77-33978
262	3:45873	*See* N-77-33979
263	3:46036	*See* N-77-33980
264	3:46107	*See* N-77-33981
265	3:46037	*See* N-77-33982
266	3:45874	*See* N-77-33983
267	3:45946	*See* N-77-33984
268	3:46033	Dep. NTIS (US Sales Only), PC A02/MF A01
269	3:45947	*See* N-77-33986
270	3:45948	*See* N-77-33987
271	3:46097	*See* N-77-34016
272	3:46038	*See* N-77-33988
275	3:45550	*See* N-77-33990
276	3:45989	*See* N-77-33991
277	3:46039	*See* N-77-33992
278	3:45990	*See* N-77-33993
279	3:45949	*See* N-77-33994
280	3:45551	*See* N-77-33995
281	3:45950	*See* N-77-33996
282	3:45951	*See* N-77-33997
285	3:45872	Dep. NTIS (US Sales Only), PC A02/MF A01
289	3:46034	Dep. NTIS (US Sales Only), PC A03/MF A01
291	3:46035	Dep. NTIS (US Sales Only), PC A02/MF A01
294	3:45991	*See* N-77-34002
295	3:46040	*See* N-77-34003
296	3:45875	*See* N-77-34004
297	3:46041	*See* N-77-34005
IPPJ-J-		
27	3:45934	*See* N-77-33998
IS-		
4353	3:45112	Dep. NTIS, PC A03/MF A01
4370	3:44213	Dep. NTIS, PC A03/MF A01
IS-ICP-		
48	3:44029	Dep. NTIS, PC A02/MF A01
50	3:44123	Dep. NTIS, PC A02/MF A01
51	3:44030	Dep. NTIS, PC A08/MF A01
IS-M-		
137	3:45845	Dep. NTIS, PC A02/MF A01
145	3:44958	Dep. NTIS, PC A02/MF A01
ISL-CO-		
214/76	3:45904	*See* N-77-33495
ISL-R-		
137/76	3:45167	*See* N-77-33514
JAERI-M-		
7043	3:46102	Dep. NTIS (US Sales Only), PC A03/MF A01
7062	3:46095	Dep. NTIS (US Sales Only), PC A05/MF A01
7103	3:46096	Dep. NTIS (US Sales Only), PC A06/MF A01
7121	3:45901	Dep. NTIS (US Sales Only), PC A04/MF A01
7130	3:46125	Dep. NTIS (US Sales Only), PC A03/MF A01
7198	3:46126	Dep. NTIS (US Sales Only), PC A04/MF A01
7220	3:45902	Dep. NTIS (US Sales Only), PC A03/MF A01
JEN-		
390	3:45903	Dep. NTIS (US Sales Only), PC A03/MF A01
393	3:45128	Dep. NTIS (US Sales Only), PC A03/MF A01
JPL-PUB-		
77-27(Rev.1)	3:44360	*See* N-77-33604
77-40	3:44969	*See* N-77-33519
77-51-V-2	3:45476	*See* N-77-34075
77-51-V-7	3:45477	*See* N-77-34080
JSC-		
11625	3:44939	*See* N-77-34050
12973(Vol.2)	3:44392	*See* N-77-33600
JWTR-		
2	3:45007	*See* AD-A-048772
3	3:45008	*See* AD-A-048773
K/UR-		
12	3:44214	Dep. NTIS, PC A04/MF A01
KFK-		
2465	3:44307	Dep. NTIS (US Sales Only), PC A06/MF A01
2483	3:44696	Dep. NTIS (US Sales Only), PC A17/MF A01
LA-		
6901-PR	3:44200	Dep. NTIS, PC A03/MF A01
6969-PR	3:45147	Dep. NTIS, PC A04/MF A01
7125-MS	3:46082	Dep. NTIS, PC A03/MF A01
7180-MS	3:44215	Dep. NTIS, PC A11/MF A01
7196-MS	3:45395	Dep. NTIS, PC A02/MF A01
7212-MS	3:44308	Dep. NTIS, PC A04/MF A01
7216-MS	3:45323	Dep. NTIS, PC A03/MF A01
7234-PR	3:44327	Dep. NTIS, PC A02/MF A01
7263-MS	3:45315	Dep. NTIS, PC A05/MF A01
7271-PR	3:44734	Dep. NTIS, PC A03/MF A01
7277-MS	3:44050	Dep. NTIS, PC A02/MF A01
7291-MS	3:45832	Dep. NTIS, PC A02/MF A01
7296-PR	3:44216	Dep. NTIS, PC A02/MF A01
LA-tr-		
77-72	3:45830	Dep. NTIS, PC A02/MF A01
77-73B	3:45401	Dep. NTIS, PC A02/MF A01
78-26	3:44210	Dep. NTIS, PC A03/MF A01
78-48	3:45287	Dep. NTIS, PC A02/MF A01
LA-UR-		
77-2754	3:44834	Dep. NTIS, PC A03/MF A01
78-931	3:45166	Dep. NTIS, PC A02/MF A01
78-1199	3:45450	Dep. NTIS, PC A02/MF A01
78-1205	3:45396	Dep. NTIS, PC A02/MF A01
78-1210	3:45152	Dep. NTIS, PC A02/MF A01

Report No.	Abstract No.	Availability
LBL-		
5962	3:44388	Dep. NTIS, PC A03/MF A01
6815	3:44579	Dep. NTIS, PC A08/MF A01
6889	3:44602	Dep. NTIS, PC A03/MF A01
6898	3:45129	Dep. NTIS, PC A02/MF A01
6998	3:45010	Dep. NTIS, PC A03/MF A01
7204	3:45549	Dep. NTIS, PC A05/MF A01
7205	3:45254	Dep. NTIS, PC A02/MF A01
7256	3:46138	Dep. NTIS, PC A02/MF A01
7291	3:45866	Dep. NTIS, PC A03/MF A01
7812	3:44925	Dep. NTIS, PC A05/MF A01
7817	3:44938	Dep. NTIS, PC A04/MF A01
LTR-		
11-20(Rev.B.)	3:44782	Dep. NTIS, PC A03/MF A01
1144-36	3:44783	Dep. NTIS, PC A02/MF A01
MERC/RI-		
78/3	3:44134	Dep. NTIS, PC A03/MF A01
MLM-		
2515	3:45316	Dep. NTIS, PC A03/MF A01
2517	3:44281	Dep. NTIS, PC A02/MF A01
MTR-		
6790	3:44951	*See* PB-274586
N-		
77-33223	3:45467	NTIS PCA03/MF A01
77-33226	3:45468	NTIS PCA06/MF A01
77-33296	3:44359	NTIS PCA04/MF A01
77-33348	3:45066	NTIS PCA02/MF A01
77-33387	3:45483	NTIS PCA03/MF A01
77-33467	3:44192	NTIS PCA03/MF A01
77-33468	3:44903	NTIS PCA07/MF A01
77-33479	3:44095	NTIS PCA07/MF A01
77-33495	3:45904	NTIS PCA02/MF A01
77-33514	3:45167	NTIS PCA08/MF A01
77-33519	3:44969	NTIS PCA99/MF A01
77-33600	3:44392	NTIS PCA99/MF A01
77-33601	3:44852	NTIS PCA06/MF A01
77-33602	3:44835	NTIS PCA08/MF A01
77-33603	3:44838	NTIS PCA13/MF A01
77-33604	3:44360	NTIS PCA03/MF A01
77-33605	3:44907	NTIS PCA05/MF A01
77-33606	3:44913	NTIS PCA05/MF A01
77-33607	3:44393	NTIS PCA03/MF A01
77-33608	3:44908	NTIS PCA09/MF A01
77-33609	3:44909	NTIS PCA23/MF A01
77-33683	3:44966	NTIS PCA04/MF A01
77-33684	3:45479	NTIS PCA05/MF A01
77-33737	3:45486	NTIS PCA03/MF A01
77-33929	3:45067	NTIS PCA03/MF A01
77-33978	3:45945	NTIS PCA02/MF A01
77-33979	3:45873	NTIS PCA02/MF A01
77-33980	3:46036	NTIS PCA02/MF A01
77-33981	3:46107	NTIS PCA02/MF A01
77-33982	3:46037	NTIS PCA03/MF A01
77-33983	3:45874	NTIS PCA02/MF A01
77-33984	3:45946	NTIS PCA02/MF A01
77-33986	3:45947	NTIS PCA02/MF A01
77-33987	3:45948	NTIS PCA02/MF A01
77-33988	3:46038	NTIS PCA02/MF A01
77-33990	3:45550	NTIS PCA03/MF A01
77-33991	3:45989	NTIS PCA02/MF A01
77-33992	3:46039	NTIS PCA02/MF A01
77-33993	3:45990	NTIS PCA02/MF A01
77-33994	3:45949	NTIS PCA02/MF A01
77-33995	3:45551	NTIS PCA03/MF A01
77-33996	3:45950	NTIS PCA03/MF A01
77-33997	3:45951	NTIS PCA02/MF A01
77-33998	3:45934	NTIS PCA03/MF A01
77-34000	3:46083	NTIS PCA05/MF A01
77-34002	3:45991	NTIS PCA02/MF A01
77-34003	3:46040	NTIS PCA02/MF A01
77-34004	3:45875	NTIS PCA03/MF A01
77-34005	3:46041	NTIS PCA03/MF A01
77-34016	3:46097	NTIS PCA02/MF A01
77-34018	3:45020	NTIS PCA02/MF A01
77-34050	3:44939	NTIS PCA12/MF A01
77-34062	3:45439	NTIS PCA11/MF A01
77-34065	3:45473	NTIS PCA17/MF A01
77-34066	3:45474	NTIS PCA22/MF A01
77-34068	3:45475	NTIS PCA05/MF A01
77-34075	3:45476	NTIS PCA03/MF A01
77-34080	3:45477	NTIS PCA03/MF A01
77-34091	3:45478	NTIS PCA03/MF A01
77-34092	3:45451	NTIS PCA03/MF A01
77-81939	3:44361	NTIS PCA02/MF A01

Report No.	Abstract No.	Availability
NASA-CR-		
135206(Vol.1)	3:44908	*See* N-77-33608
135206(Vol.2)	3:44909	*See* N-77-33609
135276	3:45479	*See* N-77-33684
145236	3:44359	*See* N-77-33296
150045	3:44095	*See* N-77-33479
151506	3:44907	*See* N-77-33605
151507	3:44913	*See* N-77-33606
152609	3:44393	*See* N-77-33607
152612	3:44835	*See* N-77-33602
152613	3:44838	*See* N-77-33603
155148	3:45467	*See* N-77-33223
155150	3:44966	*See* N-77-33683
155155	3:44852	*See* N-77-33601
155166	3:44360	*See* N-77-33604
155172	3:45483	*See* N-77-33387
155180	3:44969	*See* N-77-33519
155183	3:45477	*See* N-77-34080
155188	3:45476	*See* N-77-34075
155193	3:45468	*See* N-77-33226
NASA-TM-		
73790	3:45067	*See* N-77-33929
74067	3:45020	*See* N-77-34018
74624	3:44361	*See* N-77-81939
74942	3:44392	*See* N-77-33600
NASA-TM-X-		
58193	3:44939	*See* N-77-34050
71398	3:45475	*See* N-77-34068
71400	3:45478	*See* N-77-34091
71402	3:45451	*See* N-77-34092
71407	3:45439	*See* N-77-34062
72614	3:45473	*See* N-77-34065
72615	3:45474	*See* N-77-34066
73793	3:46083	*See* N-77-34000
NASA-TP-		
1033	3:45066	*See* N-77-33348
NBSIR-		
76-1088	3:44946	*See* PB-273949
77-867	3:44198	*See* PB-276047
NOAA-TM-ERL-MESA-		
16	3:44143	*See* PB-274660
NP-		
22160	3:44569	Dep. NTIS (US Sales Only), PC A02/MF A01
22298	3:44588	TIC
22300	3:44598	TIC
22301	3:44571	TIC
22302	3:44591	TIC
22552	3:44889	EPRI, Palo Alto, CA
22554	3:44890	EPRI, Palo Alto, CA
22555	3:44891	EPRI, Palo Alto, CA
22556	3:44892	EPRI, Palo Alto, CA
22785	3:44580	Dep. NTIS (US Sales Only), PC A03/MF A01
22840	3:44592	TIC
22841	3:44575	Dep. NTIS (US Sales Only), PC A09/MF A01
22850	3:44572	TIC
23011	3:44576	Dep. NTIS, PC A08/MF A01
23012	3:44581	Dep. NTIS (US Sales Only), PC A10/MF A01
23013	3:44589	Dep. NTIS (US Sales Only), PC A03/MF A01
23014	3:44577	Dep. NTIS (US Sales Only), PC A08/MF A01
23015	3:44582	Dep. NTIS (US Sales Only), PC A05/MF A01
23016	3:44583	Dep. NTIS (US Sales Only), PC A03/MF A01
23142	3:44940	Dep. NTIS (US Sales Only), PC A02/MF A01
23191	3:45293	GPO, $6.60
23197	3:45140	TIC
23211	3:44135	TIC
23264	3:44856	Dep. NTIS (US Sales Only), PC A03/MF A01
NP-tr-		
2012	3:44944	Dep. NTIS (US Sales Only), PC A02/MF A01
NRL-MR-		
3650	3:45482	*See* AD-A-048752
3652	3:45289	*See* AD-A-048750
3658	3:45933	*See* AD-A-048753
3670	3:45500	*See* AD-A-048751

Report No.	Abstract No.	Availability
NSSDC/WDC-A-R/S-		
77-04	3:45473	*See* N-77-34065
77-04A	3:45474	*See* N-77-34066
NTIS/PS-		
78/0031	3:45385	
78/0036	3:45397	
78/0039	3:45330	
78/0040	3:45331	
78/0048	3:44253	
78/0049	3:44254	
78/0050	3:45126	
78/0052	3:44086	
78/0054	3:44328	NTIS PCN01/MF N01
78/0062	3:45425	
NUREG-		
0090-10	3:45427	NTIS, $4.50
0386(Suppl.3)	3:44709	NTIS, $4.00
0397	3:44710	NTIS, $4.50
0447	3:44711	NTIS, $5.25
NUREG/CR-		
0022	3:44712	NTIS, $5.25
0027	3:44309	NTIS, $6.50
0054	3:45268	Dep. NTIS, PC A05/MF A01
0073	3:45149	Dep. NTIS, PC A03/MF A01
0135	3:45223	NTIS, $8.00
NUREG/PRDI-		
78/6	3:44713	TIC, $4.50
NVO-		
193	3:44291	Dep. NTIS, PC A04/MF A01
0655-105	3:44196	Dep. NTIS, PC A04/MF A01
OAQPS-		
1.2-079	3:45322	*See* PB-274557
ORNL-		
5382	3:45317	Dep. NTIS, PC A09/MF A01
5386	3:45013	AT
5387	3:44021	Dep. NTIS, PC A11/MF A01
ORNL/EIS-		
124	3:45406	Dep. NTIS, PC A12/MF A01
ORNL/NUREG-		
35	3:44808	Dep. NTIS, PC A04/MF A01
ORNL/NUREG/TM-		
84	3:45402	Dep. NTIS, PC A06/MF A01
178	3:44809	Dep. NTIS, PC A03/MF A01
ORNL/Sub-		
2913/7	3:44760	Dep. NTIS, PC A04/MF A01
7117/24	3:46084	Dep. NTIS, PC A04/MF A01
7117/25	3:46085	Dep. NTIS, PC A09/MF A01
ORNL/TM-		
6191/V1	3:44761	Dep. NTIS, PC A06/MF A01
6245	3:45772	Dep. NTIS, PC A02/MF A01
6246	3:45773	Dep. NTIS, PC A03/MF A01
6321	3:44261	Dep. NTIS, PC A03/MF A01
6331	3:44724	Dep. NTIS, PC A09/MF A01
6388	3:44282	Dep. NTIS, PC A02/MF A01
ORNL-tr-		
4543	3:45319	Dep. NTIS, PC A02/MF A01
4544	3:45404	Dep. NTIS, PC A02/MF A01
4567	3:44297	
4594	3:45420	Dep. NTIS, PC A02/MF A01
4598	3:44304	Dep. NTIS, PC A02/MF A01
4618	3:45366	Dep. NTIS, PC A02/MF A01
4619	3:45403	Dep. NTIS, PC A03/MF A01
4621	3:44315	Dep. NTIS, PC A02/MF A01
4622	3:45054	Dep. NTIS, PC A02/MF A01
4626	3:44300	Dep. NTIS, PC A02/MF A01
4627	3:45120	Dep. NTIS, PC A02/MF A01
4632	3:44299	Dep. NTIS, PC A02/MF A01
4653	3:45808	Dep. NTIS, PC A02/MF A01
4660	3:44833	Dep. NTIS, PC A02/MF A01
ORO-		
2408-124	3:45680	Dep. NTIS, PC A03/MF A01
2845-T1	3:45127	Dep. NTIS, PC A05/MF A01
5301-7	3:44151	Dep. NTIS, PC A03/MF A01
PANA-UVS-		
9	3:45479	*See* N-77-33684
PATENTS-DE-		(German: Deutsches Patentamt, Dienstatelle Berlin, Gitschiner Str. 97-103, 1000 Berlin 61, F.R. Germany, DM 3.- per copy, plus postage)
2,508,66/A/	3:44120	
1,545,408/C/	3:44167	
1,545,463/C/	3:44335	
1,807,818/B/	3:44384	
1,900,838/C/	3:44191	
1,919,821/B/	3:45211	
1,965,342/C/	3:44157	
2,109,891/C/	3:45243	
2,135,622/C/	3:44173	
2,146,215/C/	3:44166	
2,237,031/C/	3:44165	
2,365,468/C/	3:44025	
2,415,627/C/	3:44168	
2,458,021/A/	3:44170	
2,460,560/A/	3:44169	
2,503,367/A/	3:44059	
2,512,500/A/	3:44026	
2,513,602/A/	3:44032	
2,514,145/A/	3:44119	
2,546,777/A/	3:44840	
2,548,133/A/	3:44979	
2,555,190/A/	3:44034	
2,557,684/A/	3:44332	
2,558,850/A/	3:44107	
2,612,040/A/	3:44336	
2,633,550/A/	3:45210	
2,702,860/A/	3:44382	
2,703,430/A/	3:44383	
PATENTS-JP-		(Japanese: Hatsumei-Kyokai (Invention Association), 17 Shiba, Nishikubo-Akefune Cho, Minato-Ku, Tokyo, Japan, $.20 per page, plus postage)
1977-84,400/A/	3:44287	
1977-85699/A/	3:44298	
1977-85700/A/	3:44286	
1977-89,799/A/	3:44285	
1977-89,800/A/	3:44284	
PATENTS-US-		(US: Commissioner of Patents, Washington, D.C. 20231, USA, $.50 per copy. Government Patent Applications available from NTIS)
7Feb1978	3:44375	
3,981,800	3:44337	
4,001,683	3:45276	
4,002,916	3:44623	
4,008,399	3:45261	
4,025,794	3:45265	
4,040,867	3:44381	
4,041,210	3:44912	
4,042,755	3:44911	
4,042,757	3:44904	
4,042,946	3:45267	
4,043,317	3:44551	
4,044,332	3:45260	
4,046,135	3:44550	
4,049,966	3:45259	
4,051,834	3:44549	
4,052,613	3:44147	
4,052,662	3:45279	
4,053,684	3:44910	
4,056,090	3:44548	
4,056,093	3:44547	
4,056,879	3:44378	
4,057,439	3:44380	
4,057,476	3:44379	
4,058,109	3:44545	
4,058,110	3:44544	
4,058,111	3:44546	
4,059,149	3:44155	
4,059,150	3:44156	
4,059,649	3:44163	
4,060,070	3:44543	
4,060,395	3:44161	
4,060,479	3:44206	
4,060,480	3:44160	
4,060,498	3:44162	
4,061,130	3:44542	
4,061,267	3:44448	
4,062,346	3:44539	
4,062,347	3:44447	
4,062,351	3:44541	
4,062,352	3:44540	
4,063,593	3:44154	
4,065,593	3:44538	
4,066,815	3:44537	
4,067,314	3:44536	
4,067,315	3:44534	
4,067,317	3:44535	
4,068,361	3:44533	
4,069,593	3:44474	
4,069,674	3:44395	

Report No.	Abstract No.	Availability
4,069,809	3:44532	
4,069,810	3:44531	
4,069,811	3:44530	
4,069,812	3:44529	
4,069,971	3:44446	
4,069,973	3:44841	
4,070,205	3:44376	
4,070,689	3:44377	
4,070,870	3:44445	
4,071,016	3:44527	
4,071,018	3:44528	
4,071,659	3:44526	
4,071,763	3:45257	
4,072,142	3:44525	
4,072,262	3:44524	
4,072,289	3:45274	
4,073,282	3:44522	
4,073,283	3:44523	
4,074,678	3:44521	
4,074,704	3:44444	
4,074,706	3:44520	
4,075,034	3:44385	
4,075,063	3:44473	
4,075,489	3:44323	
4,075,490	3:45272	
4,075,492	3:45273	
4,075,847	3:44471	
4,076,013	3:44443	
4,076,014	3:44472	
4,076,015	3:44516	
4,076,016	3:44518	
4,076,024	3:44515	
4,076,025	3:44519	
4,076,026	3:44517	
4,077,391	3:44469	
4,077,393	3:44514	
4,077,849	3:44470	
4,078,174	3:45278	
4,078,545	3:44512	
4,078,546	3:44513	
4,078,547	3:44509	
4,078,548	3:44510	
4,078,549	3:44508	
4,078,603	3:44442	
4,078,944	3:44371	
4,078,945	3:44372	
4,078,966	3:44652	
4,078,967	3:44653	
4,079,191	3:44763	
4,079,236	3:44775	
4,079,237	3:45264	
4,079,249	3:44511	
4,079,724	3:44504	
4,079,725	3:44506	
4,079,726	3:44505	
4,080,221	3:44370	
4,080,269	3:44507	
4,080,271	3:44399	
4,080,954	3:44502	
4,080,955	3:44501	
4,080,956	3:44500	
4,080,957	3:44503	
4,081,086	3:44762	
4,081,322	3:44646	
4,081,323	3:44823	
4,081,324	3:44644	
4,081,409	3:44914	
4,082,144	3:45277	
4,082,652	3:44159	
4,084,379	3:44609	
4,084,408	3:45244	
4,084,549	3:44980	
4,084,558	3:44978	
4,084,559	3:44977	
4,084,560	3:44976	
4,084,562	3:44975	
4,084,563	3:44974	
4,084,570	3:44941	
4,084,908	3:46109	
4,084,989	3:45143	
4,085,004	3:44774	
4,085,036	3:44171	
4,085,194	3:44626	
4,085,199	3:45236	
4,085,200	3:44331	
4,085,331	3:44322	
4,085,332	3:44258	
4,085,333	3:44621	
4,085,343	3:45144	
4,086,026	3:44604	
4,087,202	3:44603	
4,087,375	3:44283	
PB-		
266103	3:45235	NTiS
273580	3:45361	NTIS PCA08/MF A01
273847	3:44090	NTIS PCA11/MF A01
273896	3:44853	NTIS PCA03/MF A01
273949	3:44946	NTIS PCA04/MF A01
274011	3:45297	NTIS PCA05/MF A01
274031	3:45325	NTIS PCA99/MF A01
274032	3:45380	NTIS PCA04/MF A01
274075	3:44916	NTIS PCA02/MF A01
274080	3:44854	NTIS PCA07/MF A01
274081	3:44893	NTIS PCA23/MF A01
274094	3:44855	NTIS PCA03/MF A01
274107	3:45363	NTIS PCA02/MF A01
274136	3:44959	NTIS PCA03/MF A01
274262	3:44124	NTIS PCA07/MF A01
274278	3:44862	NTIS PCA08/MF A01
274285	3:44948	NTIS PCA05/MF A01
274324	3:44096	NTIS PCA07/MF A01
274339	3:45422	NTIS PCA07/MF A01
274345	3:44097	NTIS PCA13/MF A01
274370	3:44645	NTIS PCA04/MF A01
274373	3:44098	NTIS PCA08/MF A01
274395	3:44624	NTIS PCA08/MF A01
274402	3:44099	NTIS PCA03/MF A01
274405	3:44125	NTIS PCA03/MF A01
274406	3:44126	NTIS PCA03/MF A01
274408	3:44863	NTIS PCA05/MF A01
274411	3:44860	NTIS PCA16/MF A01
274435	3:44201	NTIS PCA19/MF A01
274450	3:44158	NTIS PCA03/MF A01
274492	3:44872	NTIS PCA03/MF A01
274520	3:44202	NTIS PCE14/MF A01
274530	3:45298	NTIS PCA07/MF A01
274544	3:44625	NTIS PCA99/MF A01
274556	3:44963	NTIS PCA07/MF A01
274557	3:45322	NTIS PCA10/MF A01
274565	3:45362	NTIS PCA14/MF A01
274586	3:44951	NTIS PCA03/MF A01
274632	3:44141	NTIS PCA12/MF A01
274633	3:44142	NTIS PCA15/MF A01
274660	3:44143	NTIS PCA04/MF A01
274683	3:44100	NTIS PCA05/MF A01
274685	3:44878	NTIS PCA04/MF A01
274758	3:44617	NTIS PCA03/MF A01
274881	3:44964	NTIS PCA07/MF A01
275632	3:45386	
275692	3:45332	
275722	3:44953	NTIS PCA10/MF A01
275760	3:45299	
275826	3:44857	NTIS PCA04/MF A01
275858	3:45452	
276014	3:45358	NTIS PCA11/MF A01
276047	3:44198	
276169	3:45300	
276170	3:45301	
276171	3:45364	
276172	3:45365	
276188	3:45302	
276342-T/SL	3:45310	10: No. 6, vp.(1976)
PNE-RB-		
79	3:45285	Dep. NTIS, PC A03/MF A01
PNL-		
2040-9	3:44031	Dep. NTIS, PC A02/MF A01
2607	3:44302	Dep. NTIS, PC A03/MF A01
2700	3:45150	Dep. NTIS, PC A04/MF A01
PPGM-		
R95-76	3:45952	Dep. NTIS (US Sales Only), PC A03/MF A01
PPPL-		
1430	3:45935	Dep. NTIS, PC A02/MF A01
1440	3:45905	Dep. NTIS, PC A02/MF A01
R-		
2239-DOE	3:44725	Dep. NTIS, PC A04/MF A01
3542	3:44782	*See* LTR-11-20(Rev.B.)
RDA-TR-		
0400-002	3:44599	*See* SAN-1269-1(Vol.2)

RE-		
90	3:45468	*See* N-77-33226
RE-A-		
77-137	3:44783	*See* LTR-1144-36
RFP-		
2722	3:45134	Dep. NTIS, PC A02/MF A01
RHO-CD-		
78(Rev.)	3:44292	Dep. NTIS, MF A01
S-		
02	3:44835	*See* N-77-33602
SAI-		
76-677-WA	3:45286	*See* AD-A-048802
77-858-LJ	3:44926	Dep. NTIS, PC A19/MF A01
SAN-		
0936P48-1	3:44584	Dep. NTIS, PC A04/MF A01
1269-1(Vol.2)	3:44599	Dep. NTIS, PC A02/MF A01
1326-1/1	3:44600	Dep. NTIS, PC A12/MF A01
1396-15	3:44152	Dep. NTIS, PC A03/MF A01
SAND-		
77-1029	3:44310	Dep. NTIS, PC A04/MF A01
77-1415C	3:45153	Dep. NTIS, MF A01
77-1591	3:44311	Dep. NTIS, PC A02/MF A01
77-1630	3:44596	Dep. NTIS, PC A04/MF A01
77-1737	3:44784	Dep. NTIS, PC A03/MF A01
77-2031	3:45229	Dep. NTIS, PC A03/MF A01
77-8042	3:45014	Dep. NTIS, PC A02/MF A01
77-8056	3:44847	Dep. NTIS, PC A06/MF A01
77-8275	3:45130	Dep. NTIS, PC A03/MF A01
77-8299	3:44973	Dep. NTIS, PC A06/MF A01
78-0016C	3:44468	Dep. NTIS, PC A02/MF A01
78-0076	3:44810	Dep. NTIS, PC A03/MF A01
78-0253	3:44051	Dep. NTIS, PC A03/MF A01
78-0313	3:44153	Dep. NTIS, PC A03/MF A01
78-0364C	3:44312	Dep. NTIS, PC A02/MF A01
78-0377	3:44313	Dep. NTIS, PC A06/MF A01
78-0493	3:46139	Dep. NTIS, PC A03/MF A01
78-0574C	3:44811	Dep. NTIS, PC A02/MF A01
78-0653	3:44052	Dep. NTIS, PC A02/MF A01
78-0718	3:44812	Dep. NTIS, PC A06/MF A01
78-0742C	3:44813	Dep. NTIS, MF A01
78-0909	3:46140	Dep. NTIS, PC A02/MF A01
78-8234	3:44136	Dep. NTIS, PC A05/MF A01
SCIENTIFIC-		
1	3:45481	*See* AD-A-048628
SGD-		
398-Pt-1	3:45452	*See* PB-275858
SOLAR/0004-		
78/18	3:44441	Dep. NTIS, PC A03/MF A01
SRO-		
902-8	3:45436	Dep. NTIS, PC A13/MF A01
STF-		
71-A76020	3:44192	*See* N-77-33467
STI/PUB-		
441(Vol.1)	3:45398	IAEA, $34.00
441(Vol.2)	3:45399	IAEA, $23.00
T-		
1950	3:45432	*See* AD-A-046975
TID-		
3525-R5-S11	3:44814	Dep. NTIS, PC A11/MF A01
27802	3:44390	Dep. NTIS, PC A07/MF A01
27900	3:44053	Dep. NTIS, PC A03/MF A01
28053/1	3:44204	Dep. NTIS, PC A11/MF A01
28053/2	3:44205	Dep. NTIS, PC A18/MF A01
28163	3:44069	Dep. NTIS, PC A03/MF A01
28168	3:44498	Dep. NTIS, PC A03/MF A01
28260	3:45003	Dep. NTIS, PC A03/MF A01
28288	3:45004	Dep. NTIS, PC A02/MF A01
28375	3:45133	Dep. NTIS, PC A05/MF A01
28423	3:44073	Dep. NTIS, PC A03/MF A01
28431	3:45015	Dep. NTIS, PC A02/MF A01
TPR-		
015	3:44907	*See* N-77-33605
028-4	3:44913	*See* N-77-33606
TREE-		
1259	3:44785	Dep. NTIS, PC A03/MF A01
TRITA-EPP-		
77-12	3:45486	*See* N-77-33737
TT-		
76-54024/6	3:45310	*See* PB-276342-T/SL
U-OF-IOWA-		
77-36	3:45483	*See* N-77-33387
UCID-		
3994	3:46141	Dep. NTIS, PC A03/MF A01
17744-78-2	3:44776	Dep. NTIS, PC A02/MF A01
17749	3:46142	Dep. NTIS, PC A08/MF A01
17759	3:44054	Dep. NTIS, PC A02/MF A01
17782	3:44815	Dep. NTIS, PC A02/MF A01
17822	3:45281	Dep. NTIS, PC A07/MF A01
UCLA-		
12-1144	3:45371	Dep. NTIS, MF A01
12-1145	3:45367	Dep. NTIS, PC A02/MF A01
UCRL-		
13801	3:46127	Dep. NTIS, PC A02/MF A01
13826	3:45109	Dep. NTIS, PC A04/MF A01
13832	3:44593	Dep. NTIS, PC A02/MF A01
13834	3:46086	Dep. NTIS, PC A03/MF A01
13835	3:44293	Dep. NTIS, PC A03/MF A01
13837	3:44294	Dep. NTIS, PC A03/MF A01
13839	3:44295	Dep. NTIS, PC A02/MF A01
13849	3:44594	Dep. NTIS, PC A03/MF A01
50016-78-1	3:45132	Dep. NTIS, PC A03/MF A01
50019-77-1	3:45078	Dep. NTIS, PC A02/MF A01
50032-77	3:44055	Dep. NTIS, PC A03/MF A01
52342	3:44817	Dep. NTIS, PC A05/MF A01
52426	3:45303	Dep. NTIS, PC A03/MF A01
52431	3:45224	Dep. NTIS, PC A02/MF A01
52435	3:44818	Dep. NTIS, PC A02/MF A01
52449	3:45136	Dep. NTIS, PC A02/MF A01
80328	3:44193	Dep. NTIS, PC A02/MF A01
80340(Rev.1)	3:45381	Dep. NTIS, PC A03/MF A01
80390	3:45076	Dep. NTIS, PC A02/MF A01
80539	3:45433	Dep. NTIS, PC A04/MF A01
80592	3:44056	Dep. NTIS, PC A02/MF A01
80878	3:45110	Dep. NTIS, PC A02/MF A01
81005	3:44314	Dep. NTIS, PC A02/MF A01
UCRL-Trans-		
1547	3:44573	Dep. NTIS, PC A04/MF A01
1548	3:44927	Dep. NTIS, PC A02/MF A01
1549	3:44936	Dep. NTIS, MF A01
11347	3:45888	Dep. NTIS, MF A01
11348	3:45183	Dep. NTIS, PC A02/MF A01
11349	3:45184	Dep. NTIS, PC A02/MF A01
11350	3:45121	Dep. NTIS, PC A02/MF A01
11351	3:45185	Dep. NTIS, MF A01
11353	3:45099	Dep. NTIS, MF A01
11356	3:45892	Dep. NTIS, PC A02/MF A01
11363	3:45430	Dep. NTIS, PC A03/MF A01
11364	3:45431	Dep. NTIS, PC A02/MF A01
11365	3:45117	Dep. NTIS, PC A02/MF A01
11366	3:45407	Dep. NTIS, PC A02/MF A01
11367	3:45428	Dep. NTIS, PC A02/MF A01
11368	3:45429	Dep. NTIS, PC A02/MF A01
11369	3:45337	Dep. NTIS, PC A02/MF A01
UM-HSRI-		
77-53	3:45386	*See* PB-275632
UR-		
3490-1379	3:45375	Dep. NTIS, PC A09/MF A01
USAFESA-RT-		
2034	3:44947	*See* AD-A-048324
USGS-CIRC-		
753	3:44217	U.S. Geological Survey, Arlington, VA
UTEC-MSE-		
77-216	3:45065	*See* COO-1591-32
WAPD-TM-		
1130	3:44697	Dep. NTIS, PC A02/MF A01
1134	3:44698	Dep. NTIS, PC A02/MF A01
WARD-RB-		
3045-22	3:44699	AT
WCAP-		
8967	3:44650	Westinghouse Electric Corp., Pittsburgh, PA
9183	3:44819	NTIS
9264	3:44651	Westinghouse Electric Corp., Pittsburgh
WFPS-TME-		
071	3:46085	*See* ORNL/Sub-7117/25
X-		
661-77-237	3:45451	*See* N-77-34092
680-77-251	3:45439	*See* N-77-34062
692-77-196	3:45475	*See* N-77-34068
692-77-213	3:45478	*See* N-77-34091
Y/OA-		
2034	3:44274	Dep. NTIS, PC A02/MF A01
Y/OWI/SUB-		
77/42513	3:44275	Dep. NTIS, PC A21/MF A01
ZPR-TM-		
312	3:44786	Dep. NTIS, PC A02/MF A01

Abbreviations Used in Availability Column

AT Liquid Metal Fast Breeder Reactor applied technology is available to domestic requesters within the United States from the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.
Information regarding subscription purchase will be sent on request.
Foreign requesters should address inquiries to the above address.

Dep. DOE reports so designated are maintained in the organizations listed on the inside front cover.

EM Inquiries regarding the availability of blueline prints of DOE engineering drawings which were formerly available for sale by NTIS should be addressed to Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

GJO Available from DOE Grand Junction Office, P. O. Box 2567, Grand Junction, Colorado 81501.

GPO For sale by the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

LMEC Available *only to requesters within the United States* from the Liquid Metal Engineering Center, P. O. Box 1449, Canoga Park, California 91304.

NTIS For sale by the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161. Price given is the domestic price for paper copy; foreign purchasers add $2.50 per report copy. Some recent NTIS availability statements will include pricing codes as opposed to prices. These codes are related to actual prices in the table below.

RSO Available *only to requesters within the United States* from the Reactor Standards Office, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee 37830.

TIC Available from the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

NTIS NORTH AMERICAN PRICE CODES

Issue 4

October 1977

Most NTIS products and services are now announced by price codes and, therefore, without specific prices in NTIS journals, newsletters and indexes.

The current dollar equivalent for each code is shown in the schedule below. Orders must list the accession number(s) and be accompanied by the total dollar amount from the current schedule.

ISSUE 4 prices will be valid through March 31, 1978. After that date, source clients who have not received the latest schedule may contact the Input Branch, 703-557-4690 for the next issue.

NORTH AMERICAN CONTINENT PRICE SCHEDULE

Customers in Canada, U.S., and Mexico please use this price schedule; other addressees write for Folder PR-360-4.

A01	$3.00	E01	$3.25	T01	$110.00
A02	4.00	E02	4.75	T02	125.00
A03	4.50	E03	6.25	T03	175.00
A04	5.25	E04	7.50	T04	250.00
A05	6.00	E05	9.00	T05	300.00
A06	6.50	E06	10.50	T06	350.00
A07	7.25	E07	12.50	T07	400.00
A08	8.00	E08	15.00	T08	450.00
A09	9.00	E09	17.50	T09	500.00
A10	9.25	E10	20.00	T10	550.00
A11	9.50	E11	22.50	T11	600.00
A12	10.75	E12	25.00	T12	650.00
A13	11.00	E13	28.00	T13	675.00
A14	11.75	E14	31.00	T14	750.00
A15	12.00	E15	34.00	T15	800.00
A16	12.50	E16	37.00	T16	850.00
A17	13.00	E17	40.00	T17	900.00
A18	13.25	E18	45.00	T18	950.00
A19	14.00	E19	50.00	T19	1,000.00
A20	14.50	E20	60.00	T99	*
A21	15.00	E99	*		
A22	15.25				
A23	15.50	N01	28.00		
A24	16.25	N02	50.00		
A25	16.50				
A99	*				

*Contact NTIS for price quote

PRICES EFFECTIVE OCT. 1, 1977 THRU MAR. 31, 1978

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

☆ U. S. GOVERNMENT PRINTING OFFICE : 1978 281-129/1

Cut out appropriate form and mail in a stamped envelope to the address indicated.

Change of Address Form

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

PLEASE PRINT OR TYPE

(or) COUNTRY

Mail this form to:

NEW ADDRESS
Superintendent of Documents
Government Printing Office SSOM
Washington, D.C. 20402

Attach last subscription label here.

Subscription Order Form

SUBSCRIPTION ORDER FORM

ENTER MY SUBSCRIPTION TO:

@ $ Domestic; @ $ Foreign.

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

PLEASE PRINT OR TYPE

(or) COUNTRY

☐ Remittance Enclosed (Make checks payable to Superintendent of Documents)

☐ Charge to my Deposit Account No. .....

MAIL ORDER FORM TO:
Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

COMPLETE OR PARTIAL COLLECTIONS OF DOE REPORTS IN COUNTRIES OTHER THAN THE UNITED STATES

ARGENTINA
Buenos Aires, Comisión Nacional de Energía Atómica

AUSTRALIA
Canberra, National Library of Australia
Sutherland, New South Wales Atomic Energy Research Establishment

AUSTRIA
Vienna, International Atomic Energy Agency (IAEA)
Vienna, Zentralbibliothek der Physikalischen Institute der Universität

BELGIUM
Brussels, European Atomic Energy Community (Euratom)
Mol-Donk, Centre d'Etude de l'Energie Nucléaire

BRAZIL
Rio de Janeiro, Comissão Nacional de Energia Nuclear
São Paulo, Instituto de Energia Atómica

CANADA
Chalk River, Ontario, Atomic Energy of Canada, Ltd.
Hamilton, Ontario, McMaster University
Ottawa, National Research Council

CONGO, REPUBLIC OF
Kinshasa, Trico Nuclear Center

DENMARK
Risö, Danish Atomic Energy Commission

FINLAND
Otaniemi, Teknillinen Korkeakoulu

FRANCE
Saclay, Gif-sur-Yvette, Centre d'Etudes Nucléaires de Saclay

GERMANY, WEST
Karlsruhe, Zentralstelle für Atomkernenergie Dokumentation
Munich, Technische Universität

GREECE
Athens, Nuclear Research Center, Democritus Library

INDIA
Bombay, Trombay, Bhabha Atomic Research Center Library

IRAQ, REPUBLIC OF
Baghdad, Atomic Energy Commission, Nuclear Research Institute

IRELAND
Dublin, University College

ISRAEL
Yavne, Israel Atomic Energy Commission, Soreq Nuclear Research Centre

ITALY
Ispra, Cetis Library
Rome, Centro di Studi Nucleari della Casaccia

JAPAN
Tokyo, National Diet Library
Tokai-Mura, Naka-gun, Ibaraki-ken, Japan Atomic Energy Research Institute

KOREA, REPUBLIC OF
Seoul, Atomic Energy Research Institute

MEXICO
Mexico, D. F., Comisión Nacional de Energía Nuclear

NETHERLANDS, THE
Petten, Reactor Centrum Nederland
The Hague, Bibliothek Octrooiraad

NORWAY
Kjeller, Institutt for Atomenergi

PORTUGAL
Sacavem, Junta de Energia Nuclear

SOUTH AFRICA, REPUBLIC OF
Pretoria, Atomic Energy Board Library

SPAIN
Madrid, Junta de Energía Nuclear, Ciudad Universitaria

SWEDEN
Nyköping, Aktiebolaget Atomenergi Library

SWITZERLAND
Zürich, Swiss Federal Institute of Technology

UNITED KINGDOM
Boston Spa, Wetherby, Yorkshire, British Library Lending Division
Harwell, Didcot, Berkshire, Atomic Energy Research Establishment

IN INTERNATIONAL AGENCIES

EUROPEAN ATOMIC ENERGY COMMUNITY (EURATOM)
Brussels, Belgium
Ispra, Varese, Italy, Cetis Library

OECD NUCLEAR ENERGY AGENCY (NEA)
British Library Lending Division
Boston Spa, Wetherby, Yorkshire, England

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)
Vienna, Austria